

SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

| SUBJECT | PAGE |
|---|-------------|
| General Description | 0B-1 |
| Introduction | 0B-1 |
| Vehicle Maintenance and the Environment..... | 0B-1 |
| How This Section is Organized | 0B-1 |
| Scheduled Maintenance Services | 0B-2 |
| Using the Maintenance Schedule..... | 0B-2 |
| Selecting the Right Schedule | 0B-2 |
| Short Trip/City Definition | 0B-2 |
| Short Trip/City Schedule Summary | 0B-2 |
| Long Trip/Highway Definition | 0B-2 |
| Long Trip/Highway Schedule Summary..... | 0B-2 |
| Short Trip/City Maintenance Schedule (Gasoline Engines) | 0B-3 |
| Short Trip/City Maintenance Schedule (Diesel Engines)..... | 0B-8 |
| Footnotes..... | 0B-15 |
| Long Trip/Highway Maintenance Schedule (Gasoline Engines) | 0B-15 |
| Long Trip/Highway Maintenance Schedule (Diesel Engines)..... | 0B-17 |
| Footnotes..... | 0B-22 |
| Owner/Driver Checks and Services..... | 0B-22 |
| Periodic Maintenance Inspections..... | 0B-23 |
| Engine Oil and Filter Change..... | 0B-23 |
| Oil Filter | 0B-23 |
| Engine Oil Viscosity..... | 0B-23 |
| Recommended Fluids and Lubricants | 0B-24 |
| Maintenance Items | 0B-24 |
| Approximate Fluid Capacities | 0B-25 |
| Adjustable Belt Tension Specifications | 0B-26 |

GENERAL DESCRIPTION

INTRODUCTION

This section covers the maintenance required to retain safety, dependability and emission control performance.



Important

Keep the engine oil at the proper level and change as recommended.

VEHICLE MAINTENANCE AND THE ENVIRONMENT

Proper vehicle maintenance not only keeps the vehicle in good working condition, but also helps the environment. All recommended maintenance procedures are important. Improper vehicle maintenance or the removal of important components can significantly affect the environment. Improper fluid levels or even the wrong

tire inflation can increase emission levels. To help protect the environment, and to help keep the vehicle in good condition, perform all recommended maintenance.

HOW THIS SECTION IS ORGANIZED

The remainder of this section is divided into the following five parts:

“Scheduled Maintenance Services” shows what services to perform and how often. Some of these services can be complex, and require a trained technician to perform.

CAUTION: Performing maintenance work on a vehicle can be dangerous. Attempting repairs or service without the appropriate training, tools, and equipment could cause injury to you or others and damage to the vehicle.

OB-2 MAINTENANCE AND LUBRICATION

"Owner/Driver Checks and Services" tells what the owner/driver should check at the intervals specified.

"Periodic Maintenance Inspections" explains important inspections that a trained technician should perform.

"Recommended Fluids and Lubricants" lists some products GM recommends to help keep this vehicle properly maintained. Use these products, or their equivalents, whenever performing maintenance services.

SCHEDULED MAINTENANCE SERVICES

USING THE MAINTENANCE SCHEDULE

Because of the different ways GM vehicles are used, maintenance needs vary. More frequent maintenance intervals than found in this manual may be needed. When reading this section, keep in mind the conditions under which the vehicle is operated, and adjust the maintenance intervals accordingly.

The proper fluids and lubricants to use are listed in "Recommended Fluids and Lubricants" in this section. Use the proper fluids and lubricants whenever servicing this vehicle.

The maintenance schedules found in this manual are for vehicles that:

- Carry passengers and cargo within recommended limits. Refer to "Vehicle Certification Label" in SECTION 0A.
- Are driven on reasonable road surfaces within legal driving limits.
- Are driven off-road in the recommended manner. Refer to the Owner's Manual.
- Use the recommended unleaded fuel.

SELECTING THE RIGHT SCHEDULE

Short Trip/City Definition

Follow the Short Trip/City maintenance schedule if any one of these are true:

- Most trips are less than 5 to 10 miles (8 to 16 km). This is particularly important when outside temperatures are below freezing.
- Most trips include extensive idling (such as frequent driving in stop and go traffic).
- The vehicle is operated in dusty areas or off-road frequently.
- Trailer towing or using a carrier on top of the vehicle frequently.
- The vehicle is used for delivery service, police, taxi, or other commercial applications.

Short Trip/City Maintenance Schedule Summary

These intervals summarize the Short Trip/City Maintenance Schedule. See "Short Trip/City Maintenance Schedule" in this section, for the complete maintenance schedule.

Every 3,000 Miles (5 000 km) or 3 Months

Engine Oil and Filter Change

Chassis Lubrication

Drive Axle Service. Refer to "Footnotes" in this section.

At 6,000 Miles (10 000 km)

Then Every 12,000 Miles (19 500 km)

Tire Rotation

Every 15,000 Miles (25 000 km)

Shields and Underhood Insulation Inspection (GVWR above 8,500 lbs only).

Thermostatically Controlled Engine Cooling Fan Check.

Front Wheel Bearing Repack (2 Wheel Drive Only)

Every 30,000 Miles (50 000 km)

Fuel Filter Replacement

Every 50,000 Miles (83 000 km)

Automatic Transmission Service (vehicles over 8600 GVWR or driven under severe conditions).

Every 60,000 Miles (100 000 km)

Engine Drive Belt Inspection

Fuel Tank, Cap and Lines Inspection

Exhaust Gas Recirculation System Inspection.

Evaporative Control System Inspection.

Every 100,000 Miles (166 000 km)

Spark Plug Replacement

Spark Plug Wire Inspection

Engine Timing Check

Drain, flush and fill the cooling system.

Positive Crankcase Ventilation (PCV) Valve Inspection.

Long Trip/Highway Definition

Follow the Long Trip/Highway maintenance schedule ONLY if none of the conditions from the Short Trip/City maintenance schedule are true.

Long Trip/Highway Schedule Summary

These service intervals summarize the Long Trip/Highway Maintenance Schedule. See "Long Trip/Highway Maintenance Schedule" in this section, for the complete maintenance schedule.

Long Trip/Highway Intervals

Every 7,500 Miles (12 500 km)

Engine Oil and Filter Change (or every 12 months)

Chassis Lubrication (or every 12 months)

Drive Axle Service. Refer to "Footnotes" in this section.

At 7,500 Miles (12 500 km)

Then Every 15,000 Miles (25 000 km)

Tire Rotation

Every 15,000 Miles (25 000 km)

Shields and Underhood Insulation Inspection (GVWR above 8,500 lbs only).

Thermostatically Controlled Engine Cooling Fan Check.

Every 30,000 Miles (50 000 km)

Fuel Filter Replacement.

Front Wheel Bearing Repack (2 Wheel Drive Only).

Every 60,000 Miles (100 000 km)

Engine Accessory Drive Belt Inspection.

Fuel Tank, Cap and Lines Inspection.

Exhaust Gas Recirculation System Inspection.
Evaporative Control System Inspection.
Every 100,000 Miles (166 000 km)
Spark Plug Replacement.

Spark Plug Wire Inspection.
Positive Crankcase Ventilation (PCV) Valve Inspection.
Drain, flush and fill the cooling system.

SHORT TRIP/CITY MAINTENANCE SCHEDULE (GASOLINE ENGINES)

The services shown in this schedule up to 100,000 miles (166 000 km) should be performed after 100,000 miles (166 000 km) at the same intervals.

3,000 Miles (5 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

6,000 Miles (10 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

9,000 Miles (15 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

12,000 Miles (20 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

15,000 Miles (25 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

18,000 Miles (30 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

OB-4 MAINTENANCE AND LUBRICATION

21,000 Miles (35 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

24,000 Miles (40 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

27,000 Miles (45 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

30,000 Miles (45 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter. *An Emission Control Service.**
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.

- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Rotate tires. Refer to SECTION 3E.

33,000 Miles (55 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

36,000 Miles (60 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

39,000 Miles (65 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

42,000 Miles (70 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

45,000 Miles (75 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Inspect air filter if driving in dusty conditions. Replace filter if necessary. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

48,000 Miles (80 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

50,000 Miles (83 000 km)

- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.

51,000 Miles (85 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

54,000 Miles (90 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

57,000 Miles (95 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

60,000 Miles (100 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Inspect engine accessory drive belt. *An Emission Control Service.*
- Replace fuel filter. *An Emission Control Service.**
- Inspect fuel tank, cap and lines for damage or leaks. Inspect fuel cap gasket for any damage. Replace parts as needed. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter. *An Emission Control Service.**
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

OB-6 MAINTENANCE AND LUBRICATION

- Conduct evaporative control system inspection. Check all fuel and vapor lines and hoses for proper hook-up, routing and condition. Check that the purge valve works properly (if equipped). Replace as needed.
- Conduct Exhaust Gas Recirculation (EGR) system inspection.

63,000 Miles (105 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

66,000 Miles (110 000 km).

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

69,000 Miles (115 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

72,000 Miles (120 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

75,000 Miles (125 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

78,000 Miles (130 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

81,000 Miles (135 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

84,000 Miles (140 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

87,000 Miles (145 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

90,000 Miles (150 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Replace fuel filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Rotate tires. Refer to SECTION 3E.

93,000 Miles (155 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

96,000 Miles (160 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

99,000 Miles (165 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

100,000 Miles (166 000 km)

- Replace spark plugs *An Emission Control Service.*
- Inspect spark plug wires. *An Emission Control Service.*
- Drain, flush and refill cooling system (or every 60 months, whichever occurs first). Inspect hoses. Clean radiator, condenser, pressure cap and neck. Pressure test the cooling system and pressure cap. *An Emission Control Service.*
- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.
- Inspect Positive Crankcase Ventilation (PCV) Valve.

SHORT TRIP/CITY MAINTENANCE SCHEDULE (DIESEL ENGINES)

The services shown in this schedule up to 100,000 miles (166 000 km) should be performed after 100,000 miles (166 000 km) at the same intervals.

2,500 Miles (4 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

5,000 Miles (8 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

7,500 Miles (12 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

- Rotate tires. Refer to SECTION 3E.

10,000 Miles (16 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

12,500 Miles (20 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

15,000 Miles (24 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Inspect air cleaner filter if the vehicle has been driven in dusty conditions. Replace filter if necessary. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

17,500 Miles (28 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

20,000 Miles (32 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

22,500 Miles (36 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case

shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

25,000 Miles (40 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

27,500 Miles (44 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

30,000 Miles (48 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Replace air filter. *An Emission Control Service.*
- Replace fuel filter.
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.

OB-10 MAINTENANCE AND LUBRICATION

- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

32,500 Miles (52 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

35,000 Miles (56 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

37,500 Miles (60 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball

joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Rotate tires. Refer to SECTION 3E.

40,000 Miles (64 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

42,500 Miles (68 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

45,000 Miles (72 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four

wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Inspect air cleaner filter if the vehicle has been driven in dusty conditions. Replace filter if necessary. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

47,500 Miles (76 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

50,000 Miles (80 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.

- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

52,500 Miles (84 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

55,000 Miles (88 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

57,500 Miles (92 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

60,000 Miles (96 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*

OB-12 MAINTENANCE AND LUBRICATION

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Replace air filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Check the crankcase depression regulator valve system for any worn, plugged or collapsed hoses. *An Emission Control Service.*
- Replace fuel filter.
- Check the EGR System (if equipped) (except Code F engine). *An Emission Control Service.*
- Inspect accessory drive (serpentine) belt for cracks, fraying and wear and check belt for proper tension. Adjust or replace belt as needed. *An Emission Control Service.*
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

62,500 Miles (100 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

65,000 Miles (104 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four

wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

67,500 Miles (108 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

70,000 Miles (112 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

72,500 Miles (116 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

75,000 Miles (120 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect air cleaner filter if the vehicle has been driven in dusty conditions. Replace filter if necessary. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

77,500 Miles (124 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

80,000 Miles (128 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

82,500 Miles (132 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.

85,000 Miles (136 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

87,500 Miles (140 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

OB-14 MAINTENANCE AND LUBRICATION

90,000 Miles (144 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Replace air filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter.

92,500 Miles (148 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

95,000 Miles (152 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

97,500 Miles (156 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking

brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

100,000 Miles (160 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Drain, flush and refill the cooling system with new coolant (or every 60 months, whichever occurs first).
- Inspect the hoses and replace them if they are cracked, swollen, or deteriorated. Tighten all hose clamps (except constant tension clamps). Remove debris and clean the outside of the radiator and air conditioning condenser. Wash the radiator neck. To ensure proper operation, pressure test the radiator and cap.
- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.

FOOTNOTES

The California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. GM, however, urges that all recommended maintenance be recorded.

Drive Axle Service:

- Locking Differential—Drain fluid and refill at first engine oil change. At subsequent oil changes, check fluid level and add fluid as needed. If driving in dusty areas or towing a trailer, drain fluid and refill every 15,000 miles (25 000 km).

- Standard Differential—Check fluid level and add fluid as needed at every oil change. If driving in dusty areas or towing a trailer, drain fluid and refill every 15,000 (25 000 km).
- More frequent lubrication may be required for heavy-duty or off-road use.
- 3500 HD Models with applications requiring extreme overload/trailer towing conditions and high-speed (above 45 mph or 70 km/h) conditions for extended periods of time must have the drive axle fluid changed every 30,000 miles (50,000 km).

LONG TRIP/HIGHWAY MAINTENANCE SCHEDULE (GASOLINE ENGINES)

The services shown in this schedule up to 100,000 miles (166 000 km) should be performed after 100,000 miles (166 000 km) at the same intervals.

7,500 Miles (12 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

15,000 Miles (25 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

22,500 Miles (37 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines

and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
 - Rotate tires. Refer to SECTION 3E.
- ### 30,000 Miles (50 000 km)
- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
 - Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
 - Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
 - For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
 - Replace fuel filter. *An Emission Control Service.*
 - Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
 - If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

37,500 Miles (62 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

OB-16 MAINTENANCE AND LUBRICATION

45,000 Miles (75 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

50,000 Miles (83 000 km)

- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.

52,500 Miles (87 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

60,000 Miles (100 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Inspect engine accessory drive belt. *An Emission Control Service.*

- Replace fuel filter. *An Emission Control Service.*
- Inspect fuel tank, cap and lines for damage or leaks. Inspect fuel cap gasket for any damage. Replace parts as needed. *An Emission Control Service.*
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Conduct Exhaust Gas Recirculation (EGR) system inspection.
- Conduct evaporative control system inspection. Check all fuel and vapor lines and hoses for proper hook-up, routing and condition. Check that the purge valve works properly (if equipped). Replace as needed.

67,500 Miles (112 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

75,000 Miles (125 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

82,500 Miles (137 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- Rotate tires. Refer to SECTION 3E.

90,000 Miles (150 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter. *An Emission Control Service.*
- Vehicles With GVWR Above 8,500 lbs Only: Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.

97,500 Miles (162 500 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission shift linkage, transfer case shift linkage, parking brake cable guides, rear driveline center splines, front axle propshaft splines and brake pedal springs. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

- Rotate tires. Refer to SECTION 3E.

100,000 Miles (166 000 km)

- Drain, flush and refill cooling system (or every 60 months, whichever occurs first). Inspect hoses. Clean radiator, condenser, pressure cap and neck. Pressure test the cooling system and pressure cap. *An Emission Control Service.*

- Inspect spark plug wires.

- Replace spark plugs. *An Emission Control Service.*

- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:

A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.

B. In hilly or mountainous terrain.

C. When doing frequent trailer towing.

D. Uses such as found in taxi, police or delivery service.

- Inspect Positive Crankcase Ventilation (PCV) Valve.

LONG TRIP/HIGHWAY MAINTENANCE SCHEDULE (DIESEL ENGINES)

The services shown in this schedule up to 100,000 miles (166 000 km) should be performed after 100,000 miles (166 000 km) at the same intervals.

5,000 Miles (8 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

10,000 Miles (16 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*

- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.

- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.

- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.

OB-18 MAINTENANCE AND LUBRICATION

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

15,000 Miles (24 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

20,000 Miles (32 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up. Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

25,000 Miles (40 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricat-

ed unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Rotate tires. Refer to SECTION 3E.

- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

30,000 Miles (48 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Replace air filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter.
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

35,000 Miles (56 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

40,000 Miles (64 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

45,000 Miles (72 000 km)

- Change engine oil and filter (or every 3 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

50,000 Miles (80 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:

- A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
- B. In hilly or mountainous terrain.
- C. When doing frequent trailer towing.
- D. Uses such as found in taxi, police or delivery service.

- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

55,000 Miles (88 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

60,000 Miles (96 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Replace air filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).

OB-20 MAINTENANCE AND LUBRICATION

- Check the crankcase depression regulator valve system for any worn, plugged or collapsed hoses. *An Emission Control Service.*
- Replace fuel filter.
- Check the EGR System (if equipped) (except Code F engine). *An Emission Control Service.*
- Inspect accessory drive (serpentine) belt for cracks, fraying and wear and check belt for proper tension. Adjust or replace belt as needed. *An Emission Control Service.*
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

65,000 Miles (104 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

70,000 Miles (112 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.

- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

75,000 Miles (120 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

80,000 Miles (128 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

85,000 Miles (136 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

90,000 Miles (144 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Replace air filter. *An Emission Control Service.*
- For 2 Wheel Drive vehicles only: Clean and repack the front wheel bearings (or at each brake relining, whichever occurs first).
- Replace fuel filter.
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

95,000 Miles (152 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines,

and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).

- Rotate tires. Refer to SECTION 3E.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

100,000 Miles (160 000 km)

- Change engine oil and filter (or every 12 months, whichever occurs first). *An Emission Control Service.*
- Lubricate the front suspension, kingpin bushings, steering linkage, transmission linkage, parking brake cable guides, rear driveline center splines, and brake pedal springs. Additionally, for four wheel drive vehicles, lubricate the transfer case shift linkage and front axle propshaft splines. Ball joints and kingpin bushings should not be lubricated unless their temperature is 10° F (-12° C) or higher. Complete the listed lubrication service items at this mileage interval (or every 12 months, whichever occurs first).
- Drain, flush and refill the cooling system with new coolant (or every 60 months, whichever occurs first).
- Inspect the hoses and replace them if they are cracked, swollen, or deteriorated. Tighten all hose clamps (except constant tension clamps). Remove debris and clean the outside of the radiator and air conditioning condenser. Wash the radiator neck. To ensure proper operation, pressure test the radiator and cap.
- Change automatic transmission fluid and filter if the vehicle's GVWR is over 8600 lbs. or if the vehicle is mainly driven under one or more of these conditions:
 - A. In heavy traffic where the outside temperature regularly reaches 90° F (32° C) or higher.
 - B. In hilly or mountainous terrain.
 - C. When doing frequent trailer towing.
 - D. Uses such as found in taxi, police or delivery service.
- Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
- Check the air intake system installation to assure that gaskets are properly sealed and that hose connections, fasteners and other components are tight. Also check to be sure that the air cleaner housing is properly seated, the cover fits tightly and the wing nuts are tight. Tighten connections and fasteners or replace damaged parts as necessary.
- If the engine has a thermostatically controlled cooling fan, inspect all hoses and ducts for proper hook-up (or every 12 months, whichever occurs first). Be sure the valve works properly.
- Check rear/front axle fluid level and add fluid as needed. Check constant velocity joints and axle seals for leaking.

OB-22 MAINTENANCE AND LUBRICATION

FOOTNOTES

The California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. We, however, urge that all recommended maintenance be recorded.

Drive Axle Service:

- Locking Differential—Drain fluid and refill at first engine oil change. At subsequent oil changes, check fluid level and add fluid as needed. If driving in dusty areas or towing a trailer, drain fluid and refill every 15,000 miles (25 000 km).

- Standard Differential—Check fluid level and add fluid as needed at every oil change. If driving in dusty areas or towing a trailer, drain fluid and refill every 15,000 (25 000 km).
- More frequent lubrication may be required for heavy-duty or off-road use.
- 3500 HD Models with applications requiring extreme overload/trailer towing conditions and high-speed (above 45 mph or 70 km/h) conditions for extended periods of time must have the drive axle fluid changed every 30,000 miles (50,000 km).

OWNER/DRIVER CHECKS AND SERVICES

Listed below are checks and services that should be performed at the intervals specified to help ensure the safety, dependability and emission control performance of the vehicle.

Make sure all necessary checks and services are completed as scheduled. When adding fluids or lubricants to the vehicle, use only those shown in "Recommended Fluids and Lubricants" in this section.

At the First 100, 1,000 and 6,000 Miles (160, 1 600 and 10 000 km)

For vehicles with dual wheels, check dual wheel nut torque. For proper torque, refer to SECTION 3E.

At Each Fuel Fill

It is important to perform these underhood checks at each fuel fill.

Engine Oil Level

Check the engine oil level and add the proper oil if necessary.

Engine Coolant Level

Check the engine coolant level and add the proper coolant mixture if necessary. Refer to SECTION 6B.

Windshield Washer Fluid Level

Check the windshield washer fluid level in the windshield washer tank and add the proper fluid if necessary. Refer to SECTION 8E1.

At Least Once A Month

Tire Inflation

Check tire inflation. Make sure tires are inflated to the pressures specified on the Certification/Tire label located on the driver's door.

Cassette Deck.

Clean cassette deck. Cleaning should be done every 50 hours of tape play. Refer to SECTION 9A.

At Least Once A Year

Key Lock Cylinders

Lubricate the key lock cylinders with the lubricant specified in "Recommended Fluids and Lubricants," in this section.

Body Lubrication

Lubricate all body door hinges, the body hood, fuel door and rear compartment hinges, latches and locks including interior glove box and console doors, and any

moving seat hardware. Lubricate the hood safety lever pivot and prop rod pivot. More frequent lubrication may be required when exposed to a corrosive environment.

Starter Switch

CAUTION: When performing this check, the vehicle could move suddenly. If it does, you or others could be injured. Follow the steps below.

1. Before you start, make sure you have enough room around the vehicle.
2. Firmly apply both the parking brake and the regular brake.

NOTE: Do not use the accelerator pedal, and be ready to turn off the engine immediately if it starts.

3. Try to start the engine in each gear. The starter should work only in PARK (P) or NEUTRAL (N). If the starter works in any other position, the vehicle needs service.

Steering Column Lock

While parked, and with the parking brake set, try to turn the key to "LOCK" in each shift lever position.

- With an automatic transmission, the key should turn to lock only when the shift lever is in (P) "PARK".

On vehicles with a key release button, try to turn the key to lock without the button. The key should turn to "LOCK" only with the key button depressed.

On all vehicles, the key should come out only in "LOCK".

Parking Brake and Automatic Transmission (P) "PARK" Mechanism Check.

CAUTION: When performing this check, the vehicle could begin to move. You or others could be injured and property could be damaged. Make sure there is room in front of your vehicle in case it begins to roll. Be ready to apply the regular brake at once should the vehicle begin to move.

Park on a fairly steep hill, with the vehicle facing downhill. Keeping your foot on the regular brake, set the parking brake.

- To check the parking brake: With the engine running and transmission in NEUTRAL (N), slowly remove foot pressure from the regular brake pedal. Do this until the vehicle is held by the parking brake only.

- To check the PARK (P) mechanism's holding ability: Shift to PARK (P). Then release all brakes.

Lap and Shoulder Belts Condition and Operation

Inspect belt system, including: webbing, buckles, latch plates, retractors, guide loops and anchors. Replace the belt if the webbing has been cut or otherwise damaged.

PERIODIC MAINTENANCE INSPECTIONS

Listed below are inspections and services that should be performed at least twice a year (for instance, each spring and fall). Make sure any necessary repairs are completed at once.

Steering and Suspension Inspection

Inspect the front and rear suspension and steering system for damaged, loose or missing parts, signs of wear, or lack of lubrication. Inspect power steering lines and hoses for proper hookup, binding, leaks, cracks, chafing, etc. Lubricate the steering linkage.

Exhaust System Inspection

Inspect the complete exhaust system. Inspect the body near the exhaust system. Look for broken, damaged, missing or out-of-position parts as well as open seams, holes, loose connections, or other conditions that could cause a heat build-up in the floor pan or could let exhaust fumes into the vehicle. Refer to SECTION 6F.

Throttle Linkage Inspection

The throttle system (includes accelerator and cruise control) should operate freely without hesitation between full-closed and wide-open throttle. Any throttle system component causing hesitation or sticking should be replaced. Inspect for the following:

1. Missing parts such as retainers or clips.
2. Interference of linkage or cable conduit to critical components such as fuel lines, brake pipes, harness leads, etc.
3. Proximity of cable to exhaust system and other heat sources; check for melting and/or discoloration.

4. Clearance of throttle system moving parts throughout their travel from other stationary components.

5. Damage of components due to cable kinking, severe abrasion, mis-alignment, etc.

Drive Axle Service

Check rear/front axle fluid level and add as needed. Check constant velocity joints and axle seals for leaking.

Transfer Case Inspection

Every 12 months or at oil change intervals, check front axle and transfer case and add lubricant when necessary. Check vent hose at transfer case for kinks and proper installation. More frequent lubrication may be required on off-road use.

Radiator and Heater Hose Inspection Inspect the hoses and replace them if they are cracked, swollen or deteriorated. Inspect all pipes, fittings, and clamps; replace as needed.

Brake System Inspection

Inspect the complete system. Inspect brake lines and hoses for proper hookup, binding, leaks, cracks, chafing, etc. Inspect brake pads and shoes for cracks and wear and drums and rotors for surface condition. Inspect other brake parts such as wheel cylinders, calipers, parking brake, etc. Check parking brake adjustment. Inspect brakes more often if conditions result in frequent braking.

ENGINE OIL AND FILTER CHANGE



Important

Always use engine oil with the American Petroleum Institute Certified for Gasoline Engines "Starburst" symbol of the proper viscosity. Refer to the Owner's manual for the proper engine oil viscosity.

Oil Filter



Important

To prevent oil filter leakage, it is very important to follow the installation instructions listed below.

- A. Remove the old filter by turning it counter clockwise. Clean the gasket sealing area on the engine oil filter mounting surface. (If the engine has an adapter base, make sure the threaded nipple or bolt is properly tightened.)

- B. Lightly oil the new oil filter gasket with clean oil, and install the filter. After the oil filter gasket contacts the oil filter mounting surface, tighten 3/4 to 1 full turn. When necessary, use a cap-type wrench, strap-type wrench with handle, or equivalent to ensure proper installation.

- C. With engine oil at the proper level, run the engine three minutes and thoroughly check the filter area for leaks.

Engine Oil Viscosity

Engine oil viscosity (thickness) has an effect on fuel economy and cold-weather operation (starting and oil flow). Lower viscosity engine oils can provide better fuel economy and cold weather performance; however, higher temperature weather conditions require higher viscosity engine oils for satisfactory lubrication. Viscosity

OB-24 MAINTENANCE AND LUBRICATION

ratings can be found on the oil container or supplied by the oil manufacture.

When choosing an oil, consider the range of temperatures the vehicle will be operated in before the next oil change. Then select the recommended oil viscosity.

NOTICE: *Using oils of any viscosity other than those recommended could result in engine damage.*

RECOMMENDED FLUIDS AND LUBRICANTS

Engine Oil—GM Goodwrench® motor oil or equivalent for API Service with STARBURST SYMBOL of the recommended viscosity.

Engine Coolant—Mixture of water and GM Goodwrench® DEX-COOL™ (orange colored, Silicate-Free) Antifreeze conforming to GM specification 6277M.

Hydraulic Clutch System—Hydraulic clutch fluid GM P/N 12345347.

Hydraulic Brake System—Delco Supreme II GM P/N 1052535 or equivalent DOT-3 brake fluid.

Parking Brake Cables—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB GM P/N 1052497 or equivalent.

Power Steering System—Power steering fluid meeting requirements of GM specification 9985010, GM P/N 1050017 or equivalent.

Automatic Transmission—DEXRON® III automatic transmission fluid.

Differential (Front and Rear Axle)—SAE 80-W-90 GL-5 gear lubricant GM P/N 1052271.

Clutch Fork Ball Stud—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB GM P/N 1052497.

Front Wheel Bearings—Chassis grease meeting requirements of NLGI Grade 2, Category GC or GC-LB GM P/N 1051344.

Chassis Lubrication—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB GM P/N 1052497.

Weatherstrips—Dielectric Silicone grease GM P/N 12345379 or equivalent.

Windshield Washer Solvent—GM Optikleen washer solvent GM P/N 1051515 or equivalent.

Hood Latch Pivots and Spring Anchor—Lubriplate lubricant aerosol GM P/N 12346293 or equivalent.

Hood Latch Release Pawl—GM Multipurpose lubricant, Superlube® GM P/N 12346241 or equivalent.

Automatic Transmission Shift Linkage, Floor Shift Linkage, Hood and Door Hinges, and Body Door Hinge Pins—Multipurpose lubricant, Superlube® GM P/N 12346241 or equivalent.

Manual Transmission:

A. 5-Speed (RPO MW3)—Castrol SYNTORQ® LT or equivalent GM P/N 12346190.

B. 5-Speed (RPO MG5)—GM P/N 12345349 or equivalent.

Transfer Case—DEXRON® III automatic transmission fluid GM P/N 12345881.

Transfer Case Shift Lever, Propeller Shaft—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB GM P/N 1052497.

Constant Velocity Universal Joint—Chassis grease meeting requirements of GM 6031-M GM P/N 1052497.

Key Lock Cylinders—GM Multi-Purpose lubricant, Superlube® GM P/N 12346241 or a synthetic light weight engine oil (SAE 5W-30).

Parking Brake Cable Pivot—Chassis grease meeting requirements of NLGI Grade 2, Category GC or GC-LB GM P/N 1051344.

T2962

MAINTENANCE ITEMS

Air Cleaner Element

| | |
|--------------------------|----------------|
| 4.3L (VIN W) | AC Type A1300C |
| 5.0L (VIN M) | AC Type A1300C |
| 5.7L (VIN R) | AC Type A1300C |
| 6.5L (VIN F and S) | AC Type A1236C |
| 7.4L (VIN J) | AC Type A1300C |

Engine Oil Filter

| | |
|--------------------------|-----------------|
| 4.3L (VIN W) | AC Type PF-52 |
| 5.0L (VIN M)* | AC Type PF-1218 |
| 5.7L (VIN R)* | AC Type PF-1218 |
| 6.5L (VIN F and S) | AC Type PF-1218 |
| 7.4L (VIN J) | AC Type PF-1218 |

*Four-wheel drive vehicles use a PF-52 oil filter.

PCV Valve

| | |
|--------------------------|-----------------|
| 4.3L (VIN W) | AC Type CV-746C |
| 5.0L (M), 5.7L (R) | AC Type CV-796C |
| 7.4L (J) | AC Type CV-774C |

Spark Plugs and Gap

| | |
|--------------------|---------------------------------|
| 4.3L (VIN W) | AC Type 41-932 (1.52 mm, .060") |
| 5.0L (VIN M) | AC Type 41-932 (1.52 mm, .060") |
| 5.7L (VIN R) | AC Type 41-932 (1.52 mm, .060") |
| 7.4L (VIN J) | AC Type 41-932 (1.52 mm, .060") |

Fuel Filter

| | |
|--------------------------|-----------------|
| 4.3L (VIN W) | AC Type GF-626 |
| 5.0L (VIN M) | AC Type GF-626 |
| 5.7L (VIN R) | AC Type GF-626 |
| 6.5L (VIN F and S) | AC Type TP-1256 |
| 7.4L (VIN J) | AC Type GF-626 |

Radiator Cap

| | |
|--------------------------|---------------|
| 4.3L (VIN W) | AC Type RC-36 |
| 5.0L (VIN M) | AC Type RC-36 |
| 5.7L (VIN R) | AC Type RC-36 |
| 6.5L (VIN F and S) | AC Type RC-33 |
| 7.4L (VIN J) | AC Type RC-36 |

APPROXIMATE FLUID CAPACITIES

Engine Cooling System

| | |
|---|--------------------|
| 4.3L (VIN W) | |
| With Air Conditioning | 12.3 L (13 qts.) |
| Without Air Conditioning | 12.3 L (13 qts.) |
| 5.0L (VIN M) | |
| With Air Conditioning | 17.0 L (18 qts.) |
| Without Air Conditioning | 16.6 L (17.5 qts.) |
| 5.7L (VIN R) | |
| With Air Conditioning | 19.0 L (20 qts.) |
| Without Air Conditioning | 16.6 L (17.5 qts.) |
| With Air Conditioning—C 3500HD | 25.5 L (27 qts.) |
| Without Air Conditioning—C 3500HD | 25.0 L (26.5 qts.) |
| 6.5L (VIN F and S) | |
| With Air Conditioning | 26.0 L (27.5 qts.) |
| Without Air Conditioning | 26.0 L (27.5 qts.) |
| 7.4L (VIN J) | |
| With Air Conditioning | 26.0 L (27.5 qts.) |
| Without Air Conditioning | 23.5 L (25 qts.) |
| With Air Conditioning—C 3500HD | 27.0 L (28.5 qts.) |
| Without Air Conditioning—C 3500HD | 25.0 L (26.5 qts.) |

Engine Crankcase

| | |
|---------------------|------------------|
| 4.3L (VIN W) | |
| With Filter* | 4.3 L (4.5 qts.) |
| 5.0L (VIN M) | |
| With Filter* | 4.8 L (5.0 qts.) |
| 5.7L (VIN R)** | |
| With Filter* | 4.8 L (5.0 qts.) |
| 6.5L (VIN F and S)* | |
| With Filter* | 6.5 L (7.0 qts.) |
| 7.4L (VIN J)** | |
| With Filter* | 6.5 L (7.0 qts.) |

* Oil filter should be changed at every oil change.

** Add one additional quart for C 3500HD models

OB-26 MAINTENANCE AND LUBRICATION

Fuel Tank

| | |
|-----------------------------------|-------------------------|
| Short Bed Models | 98.0 L (26 Gallons) |
| Long Bed Models | 128.0 L (34 Gallons) |
| Four-Door Models (Standard) | 128.0 L (34 Gallons) |
| Chassis-Cab Models | |
| Standard (Side Tank) | 87.0 L (23 Gallons) |
| Optional (Rear Tank) | 68-76 L (18-20 Gallons) |
| C 3500HD Models | |
| Standard (Side Tank) | 87.0 L (23 Gallons) |
| Optional (Rear Tank) | 68-76 L (18-20 Gallons) |
| Two-Door Utility | 113.0 L (30 Gallons) |
| Four-Door Utility | 113.0 L (30 Gallons) |
| Suburban | 159.0 L (42 Gallons) |

Transmission

| | |
|---|--------------------|
| 4L60-E Automatic—Drain and Refill | 4.7 L (5 qts.) |
| After Complete Overhaul | 10.6 L (11 qts.) |
| 4L80-E Automatic—Drain and Refill | 7.3 L (7.7 qts.) |
| After Complete Overhaul | 12.8 L (13.5 qts.) |
| New Venture Gear 4500 Manual | 3.78 L (4 qts.) |
| New Venture Gear 3500 Manual | 2.0 L (2.2 qts.) |

ADJUSTABLE BELT TENSION SPECIFICATIONS

Belt tension is maintained by a spring tensioned idler pulley. No adjustment of the serpentine belt is necessary.

T2851

SECTION 0C

VIBRATION DIAGNOSIS

CAUTION: This vehicle is equipped with Supplemental Inflatable Restraint (SIR). Refer to CAUTIONS in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location view in Section 9J before performing service on or around SIR components or wiring. Failure to follow CAUTIONS could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

NOTICE: Always use the correct fastener in the correct location. When you replace a fastener, use ONLY the exact part number for that application. General Motors will call out those fasteners that require a replacement after removal. General Motors will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.

CONTENTS

| <u>SUBJECT</u> | <u>PAGE</u> |
|--|-------------|
| General Description | 0C-2 |
| Vibration Diagnosis | 0C-2 |
| Path, Source, and Responder | 0C-2 |
| Vibration Classes | 0C-2 |
| Orders of Vibration | 0C-2 |
| Vibration Categories | 0C-2 |
| Vehicle Speed Sensitive | 0C-2 |
| Engine Speed Sensitive | 0C-3 |
| Payload or Jounce Sensitive | 0C-3 |
| Torque Sensitive | 0C-3 |
| Road Testing | 0C-3 |
| Road Test | 0C-4 |
| Coast Test | 0C-4 |
| Special Tool Description (Vibration Diagnosis) | 0C-4 |
| Reed Tachometer | 0C-4 |
| Reed Tachometer Usage | 0C-4 |
| Tire Speed Chart | 0C-5 |
| Electronic Vibration Analyzer (EVA) | 0C-6 |
| Special Tool Description | 0C-6 |
| Companion Flange Runout Gauge | 0C-6 |
| Inclinometer | 0C-6 |
| On-Vehicle Service—Tire and Wheel Vibrations | 0C-8 |
| Balancing Tires and Wheels | 0C-8 |
| General Balance Precautions | 0C-8 |
| Off-Vehicle Balancing | 0C-8 |
| On-Vehicle Balancing | 0C-8 |
| Wheel Weights | 0C-8 |
| Wheel Runout | 0C-9 |
| Tire/Wheel Assembly Runout | 0C-9 |
| Correcting Non-Uniform Tires | 0C-10 |
| Hub and Axle Shaft Stud Runout | 0C-10 |
| Measuring Rotor or Axle Shaft Runout | 0C-10 |
| Measuring Axle Shaft Stud Runout | 0C-10 |
| On-Vehicle Service—Driveline Vibrations | 0C-11 |
| Propeller Shaft Runout Check | 0C-11 |
| Propeller Shaft Balance Check | 0C-11 |
| Propeller Shaft Balancing | 0C-13 |

CONTENTS (cont'd)

| SUBJECT | PAGE |
|--|-------|
| Hose Clamp Method | 0C-13 |
| Strobe Light Method | 0C-14 |
| Propeller Shaft Phasing | 0C-16 |
| Driveline Angles | 0C-16 |
| Measuring Driveline Angles | 0C-16 |
| Angle at Rear Universal Joint | 0C-16 |
| Angle at Front Universal Joint | 0C-17 |
| Rules for Measuring Driveline Angles | 0C-17 |
| Vibration Diagnosis Charts | 0C-18 |
| Technician Vibration Diagnosis Form | 0C-18 |
| Special Tools | 0C-28 |

GENERAL DESCRIPTION

VIBRATION DIAGNOSIS

Vibration is a back and forth oscillation that can be seen, heard, or felt. Imbalance or misalignment of the vehicle is usually the cause of a vibration.

Path, Source, and Responder

In many cases the vibration that is being seen, heard, or felt is not the source but the responder (Figure 1). Many times the severity of the vibration will depend on how it is transmitted through the vehicle.

VIBRATION CLASSES

Vibration problems can be classified into five sensitivity categories. Many problems fit into more than one of the categories. These categories can usually be combined into one of the following "classes" of categories:

- A. Engine Speed Sensitive Only.
- B. Vehicle Speed Sensitive Only.
- C. Torque Sensitive and Vehicle Speed Sensitive.
- D. Torque Sensitive and Engine Speed Sensitive.
- E. Torque Sensitive, Vehicle Speed Sensitive, and Jounce Sensitive.

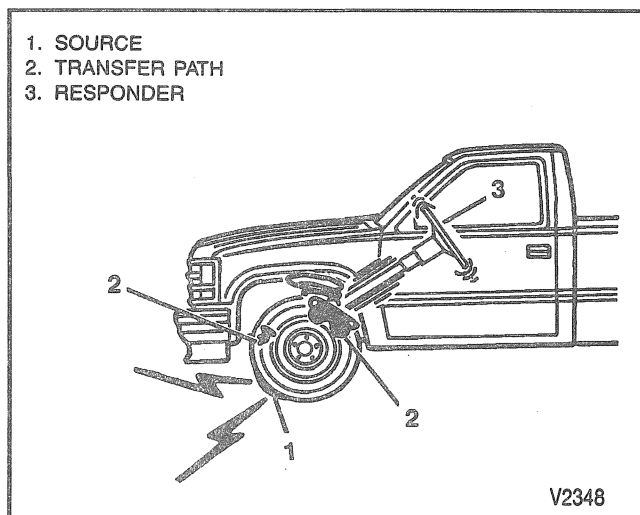


Figure 1—Vibration Source, Path, Responder

The first step in correcting a vibration problem is to determine which of the above best describe the problem. The second step is to determine the vehicle speed and rpm at which the vibration occurs or is most intense.

ORDERS OF VIBRATION

Some components vibrate more than others at a given speed. These multiple vibrations are referred to as the order of vibration. The order of a vibration is defined as the number of disturbances created by one rotation of a component. For example, a tire with one heavy spot will produce one disturbance each rotation - a first order vibration. An oval shaped tire will produce two disturbances each rotation - a second order vibration (Figure 2).

VIBRATION CATEGORIES

There are several excitation sources and many responding systems which may cause a vibration complaint. Most vibrations are caused by wheel and tire disturbances or driveline imbalances. Each of these categories has a specific vibration associated with it. By systematically classifying the vibration into one of the following categories you can eliminate many components as the source.

Vehicle Speed Sensitive

Most vibration complaints will be found to be vehicle speed sensitive. The frequency of the vibration depends only on the speed of the vehicle.

Vehicle speed sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
2. Shift the vehicle into a lower gear and again locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
3. If the problem occurs at the same vehicle speed as when the vehicle was in high gear, the vibration is vehicle speed sensitive.

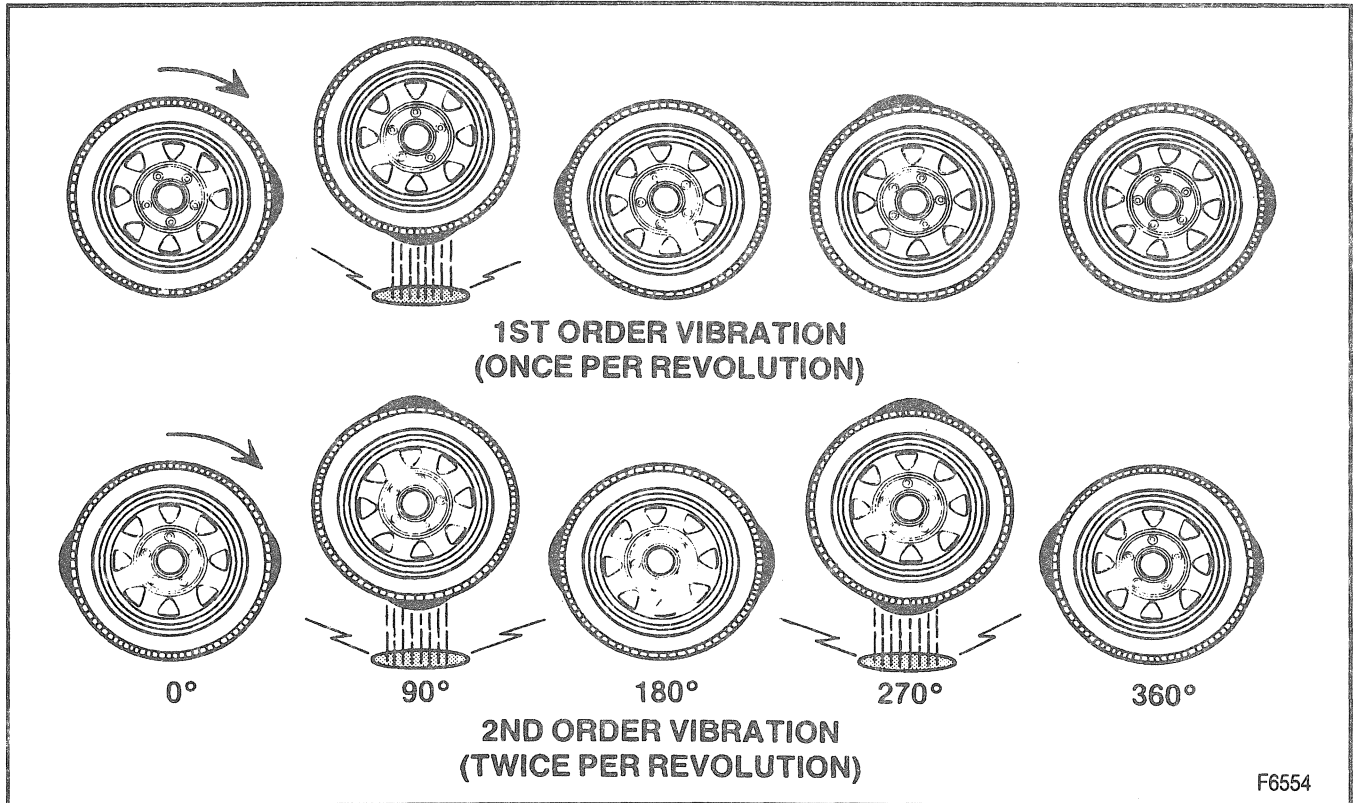


Figure 2—Order of Vibration

4. Place the transmission in neutral or park position and slowly increase engine rpm to determine an engine-speed related vibration. Record the rpm at which the vibration occurs.

Engine Speed Sensitive

Another group of vibration complaints will be found to be engine speed sensitive. The frequency of the vibration depends only on the speed of the engine, independent of the speed of the vehicle.

Engine speed sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
2. Shift the vehicle into a lower gear and again locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
3. If the problem occurs at the same rpm as when the vehicle was in high gear, the vibration is engine speed sensitive.

Payload or Jounce Sensitive

A payload or jounce sensitive problem is one which varies in intensity as the height of the vehicle changes with respect to the surface of the road. The intensity varies as the springs are extended or compressed.

Payload or jounce sensitivity can be determined as follows:

1. Drive the vehicle and observe the disturbance with varying payload.
2. Drive the vehicle over a road that dips in such a way that it causes the rear of the vehicle to move

up and down relative to the surface of the road. Keeping a constant throttle, notice when the disturbance occurs.

3. If the disturbance occurs when the vehicle height is changed due to the payload, or it occurs on roads that cause the vehicle to dip, this can be determined as payload or jounce sensitive.

Torque Sensitive

A torque sensitive problem is one which increases in intensity as the torque (power) output of the engine increases. The intensity of the vibration increases as the throttle opening is increased.

Torque sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration. Record the vehicle speed and rpm at which the problem occurs.
2. Note the vibration while varying the throttle position. Drive the vehicle with steady throttle, slowly increasing to heavy throttle by going up hill. Or apply the brakes while increasing the throttle opening then slowly decrease to minimum throttle and coast during the vibration.
3. If the vibration becomes more severe as the throttle opening is increased, the vibration is torque sensitive. This typically changes the pinion angle.

ROAD TESTING

To help diagnose and isolate the source of a vibration, it is important to road test the vehicle and use a systematic approach in narrowing down the possible causes of a vibration.

OC-4 VIBRATION DIAGNOSIS

1. When did the vibration start?
2. Did the vibration start after a repair procedure in any of the following areas?
 - Exhaust System
 - Undercoating
 - Tire Repair or Replacement
 - Wheel Alignment
 - Engine Repair

These questions will give you a basic outline and will enable you to eliminate many components and focus attention on only those items that can be responsible for the conditions encountered.

Four major component groups are usually the cause of or are related to vibration. When road testing a vehicle for vibration, remember these groups:

- Engine and mounts.
- Tires, wheels, and brake drums.
- Propeller shaft and universal joints.
- Transmission or transfer case mounts.

Before road testing a vehicle, check the following:

1. In-or-out of phase propeller shaft.
2. All fasteners for tightness at universal joints, wheel lugs, engine mounts, transmission, or transfer case mounts.
3. Tire air pressure.
4. Payload conditions.

Road Test

Road test the vehicle to diagnose the complaint. Refer to "Reed Tachometer" or "Electronic Vibration Analyzer (EVA)." Record the speed and rpm at which the greatest vibration occurs. The vibration is likely to be felt in the steering wheel or in the seat bottom. The road test can be helpful in locating the vibration source either forward or aft.

Coast Test

Drive the vehicle past the vibration speed, shift into neutral, and coast back through the vibration speed. In this test two kinds of vibrations normally occur; a shaking or a buzzing. A shaking vibration is usually caused by tires or a wheel and brake assembly problem. A buzzing vibration is usually caused by a driveline problem.

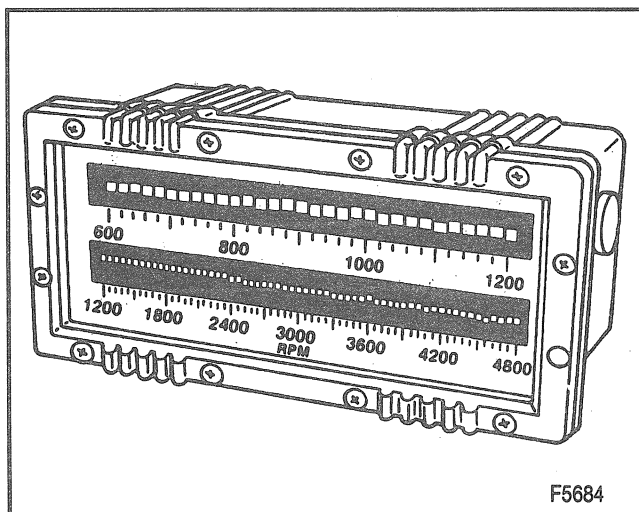


Figure 3—Reed Tachometer

SPECIAL TOOL DESCRIPTION (VIBRATION DIAGNOSIS)

Special tools can be used to identify the frequency of a rotational component with a repetitive vibration. These tools consist of a reed tachometer or an electronic vibration analyzer (EVA).

Reed Tachometer

The Biddle Frahm reed tachometer P/N 313510 (or equivalent) measures vibration in cycles per minute (CPM) (Figure 3). It consists of two rows of reeds. Each row is designed to vibrate at a particular frequency.

If you can match the rotational speed of a particular component with the frequency reading of the reed tachometer, you will know in which area to concentrate your efforts for repairs.

These frequency relationships exist for all vibrations that occur in a vehicle and understanding these relationships can often solve difficult vibration problems.

Reed Tachometer Usage

The best place to put the reed tachometer in a truck is on top of the instrument panel. This is an effective location for picking up vibration and providing ease of viewing.

However, if the vibration frequency cannot be read with the reed tachometer on the instrument panel, it can be placed in other locations that may be responding to the source of the vibration. To reduce the effect of road surface, vehicles should be test driven on a smooth road (preferably asphalt).

An important thing to be aware of when using the reed tachometer for the first time is that the reeds are very sensitive and will pick up many low amplitude vibrations (Figure 4). These will appear as slight movements of many reeds, and do not correspond to any particular component. Reed movement that corresponds to a vibrating component will be greater in amplitude, traveling the full range of the viewing area.

The following examples illustrate two typical applications of a reed tachometer. The electronic vibration analyzer (EVA) can be substituted for the reed tachometer. Refer to "Electronic Vibration Analyzer" in this section.

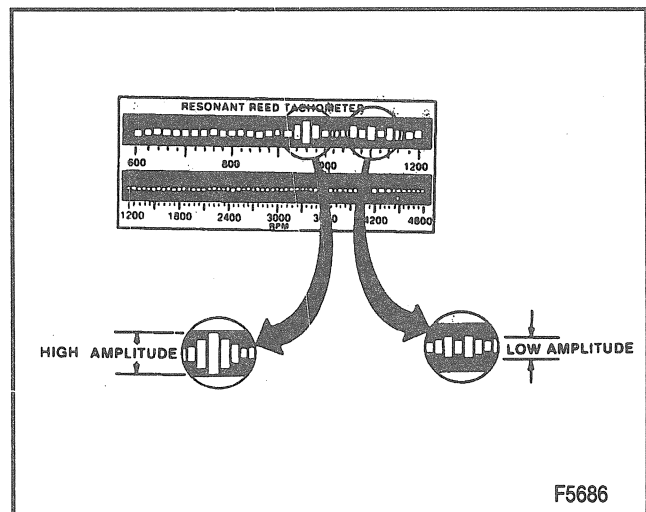


Figure 4—Amplitude

Example 1

Road test reveals low frequency (shake) vibration at 2400 rpm with the transmission in direct drive.

Known facts - Reed tachometer frequency reads at 800 cycles per minute (Figure 5).

Vibration is vehicle speed sensitive.

Rear end ratio 3.0 to 1.

Calculations - First order of tire and rear end: 2400 rpm and 3.0 to 1 rear axle ratio = 800 rpm.

First order of propshaft: 2400.

Conclusion - The vibration frequency (800) is related to the first order rotation of the tire/wheel assembly. Given this relationship, you can correct the tire/wheel assembly for a first order disturbance.

Example 2

Road test reveals high frequency vibration at 2400 rpm with the transmission in direct drive.

Known facts - Reed tachometer frequency reads at 1600 cycles per minute (Figure 6).

Vibration is vehicle speed dependent.

Rear end ratio 3.0 to 1.

Calculations - First order of tire and rear end: 2400 rpm and 3.0 to 1 rear axle ratio = 800 RPM.

First order of tire and wheel: 800.

Second order of tire and wheel: $800 \times 2 = 1600$.

Conclusion - The vibration frequency 1600 is related to the second order rotation of the tire and wheel.

Tire Speed Chart

| Tire Size | Tread | Revs/Sec at 5 mph |
|--------------|-------|-------------------|
| P235/75R15 | ALS | 1.00 |
| | OR | 0.99 |
| P275/60HR15 | AL3 | 1.03 |
| 31X10.5R15/B | OR | 0.95 |
| LT225/75R16 | ALS | 0.99 |
| | OR | 0.98 |
| LT245/75R16 | ALS | 0.95 |
| | OR | 0.94 |
| LT265/75R16 | OR | 0.90 |
| LT215/85R16 | HWY | 0.95 |
| | OR | 0.94 |
| LT235/85R16 | HWY | 0.91 |
| | OR | 0.90 |
| 7.50R16 | HWY | 0.90 |
| | OR | 0.90 |
| 8.75R16.5 | HWY | 0.98 |
| 225/70R19.5 | HWY | 0.89 |

AL3=Performance (GT+4)
 ALS=All Season
 HWY=Highway
 OR=On/Off Road

T2840

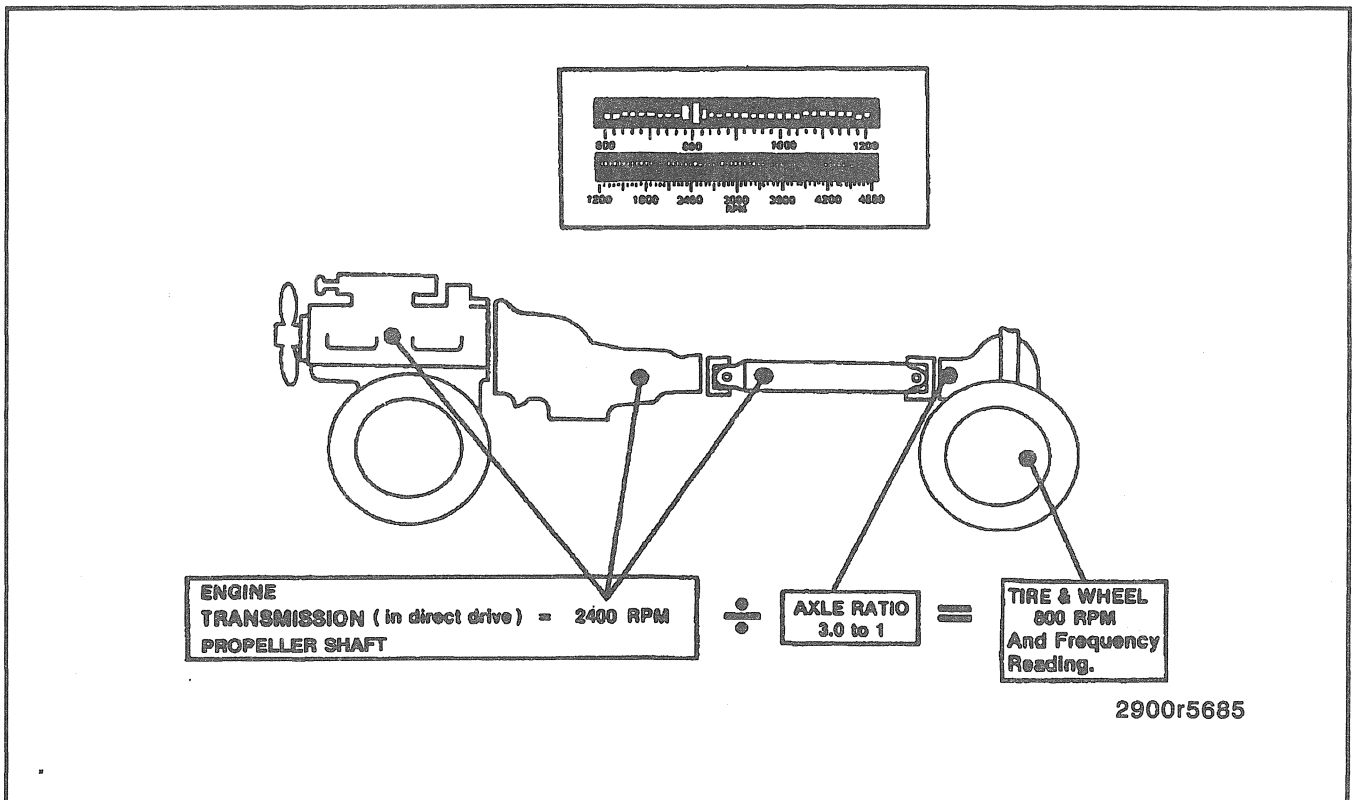


Figure 5—Reed Tachometer 1st Order Vibration

OC-6 VIBRATION DIAGNOSIS

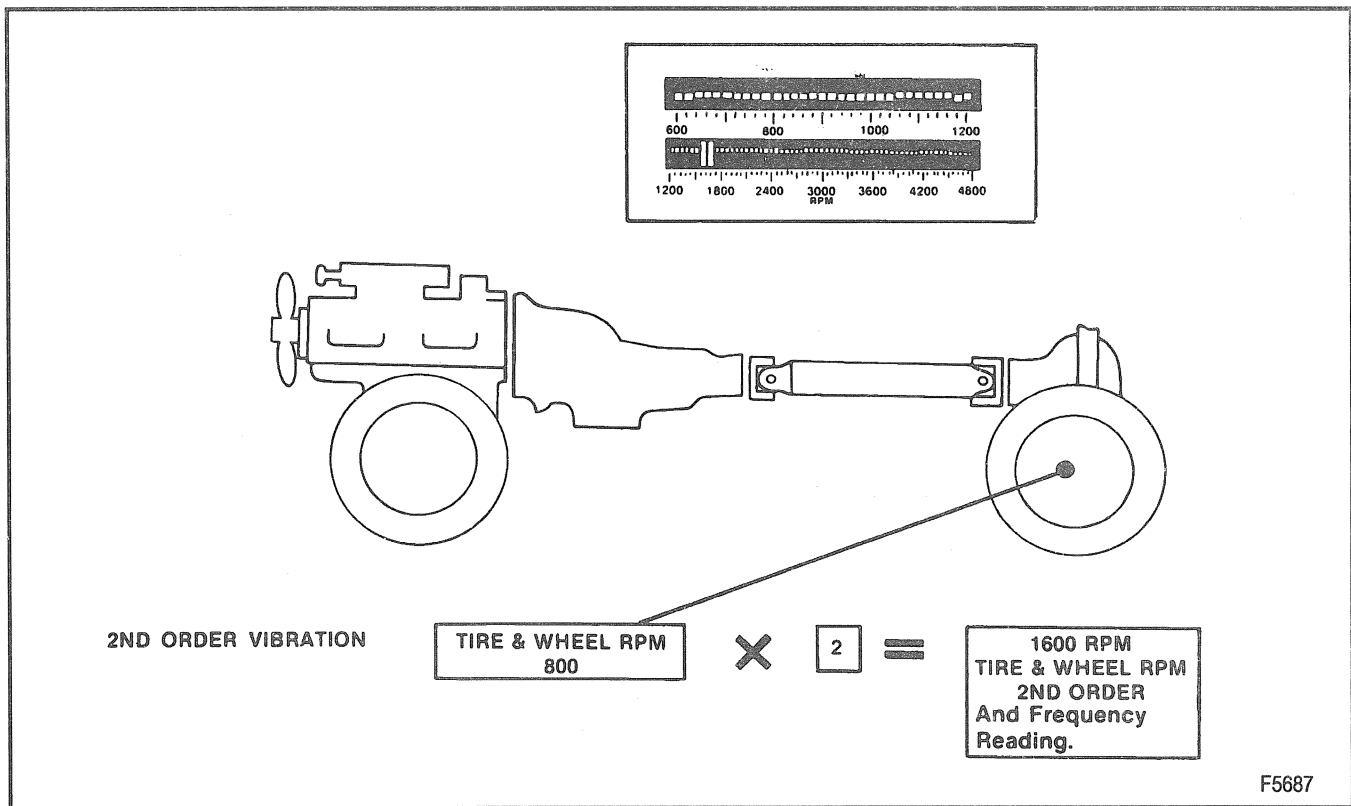


Figure 6—Reed Tachometer 2nd Order Vibration

Electronic Vibration Analyzer (EVA)

The Electronic Vibration Analyzer (EVA) J 38792 speeds up the diagnosis of vibrations by displaying the three most predominant frequencies and their amplitudes. These frequencies are displayed in bar graph form. The strongest vibration is displayed first, the next strongest second, and the weakest displayed last (Figure 7).

The EVA is equipped with a vibration sensor that can be plugged into either input A or input B on the front of the EVA.

The vibration sensor can be mounted almost anywhere on the vehicle by using a magnet or adhesive putty. There is a trigger wire on the front of the EVA that a strobe light pickup can be attached to for driveshaft balancing (Figure 8).



Important

- The vibration sensor is marked with the word "UP" on one side. For the sensor to accurately and consistently pickup vibrations, it must be mounted as close as possible to the source of the vibration in the horizontal position with the "UP" identification facing up. Refer to the instruction manual accompanying the EVA for sensor calibration.

SPECIAL TOOL DESCRIPTION

Companion Flange Runout Gauge

A good place to start when diagnosing a vibration problem is to consider pinion flange runout. Pinion flange runout affects the rear of the propshaft by moving it off its center rotating point. A pinion flange with excessive runout will have the same effect on the vehicle as a propshaft with excessive runout.

To measure pinion flange runout use J 35819 Companion Flange Runout Gauge. When working with larger pinion flanges, use the runout gauge adapter sleeves J 35819-100. A dial indicator with a magnetic base or a clamp base will also be needed.

Inclinometer

Drive line angles do not refer to the angle of the propshaft alone, but to the angle where the propshaft meets the front yoke or rear yoke on vehicles with a one-piece propshaft, and where the propshafts intersect on vehicles with a two-piece propshaft. The front and rear yokes must be included when measuring a two-piece propshaft system. The special tool used for checking driveline angles is J 23498-A, an inclinometer.

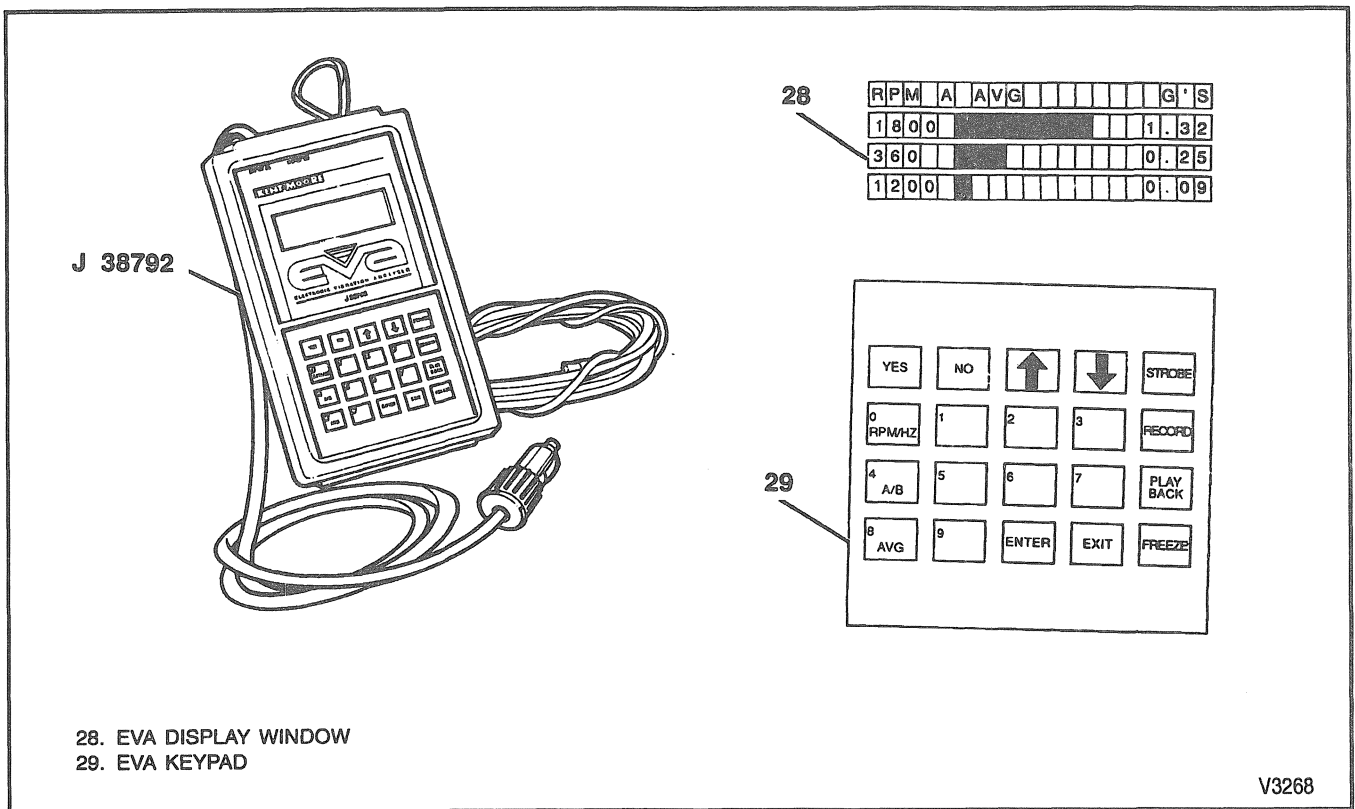


Figure 7—Electronic Vibration Analyzer (EVA)

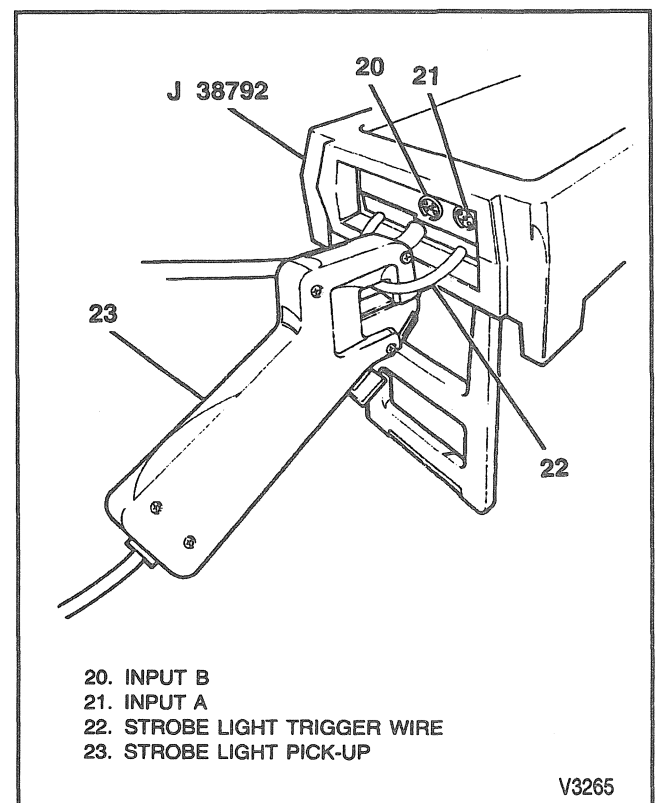


Figure 8—EVA Inputs and Connections

ON-VEHICLE SERVICE—TIRE AND WHEEL VIBRATIONS

BALANCING TIRES AND WHEELS

There are two types of tire and wheel balancing; static and dynamic. Static balance is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called wheel tramp (Figure 9). This condition will eventually cause uneven tire wear.

Dynamic balance is the equal distribution of weight on each side of the centerline so that when the wheel spins there is no tendency for it to move from side to side (Figure 10). Wheels that are dynamically unbalanced may cause wheel shimmy.

General Balance Precautions

Deposits of foreign material must be cleaned from the inside of the wheel. Remove stones from the tread to avoid operator injury during spin balancing and to obtain a good balance. The tire should be inspected for any damage, then balanced according to the equipment manufacturer's recommendations.

Whenever a heavier, solid locking wheel nut is used to replace a standard nut, it should be installed nearest the valve stem, and a 14 gram (1/2 ounce) balance weight should be added 180 degrees opposite the locking nut on the wheel's inboard side.

When rotating tires, always install the locking nut nearest the tire valve stem so that it remains opposite the balance weight. This procedure will improve the wheel balance by compensating for the heavy locking wheel nut.

Off-Vehicle Balancing

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two-plane) balance. Although they do not correct for drum or rotor unbalance, like on-vehicle spin balancing, they are more accurate. When balancing off-vehicle, the wheel should locate on the balancer with a cone through the back side of the center pilot hole not by the wheel stud holes.

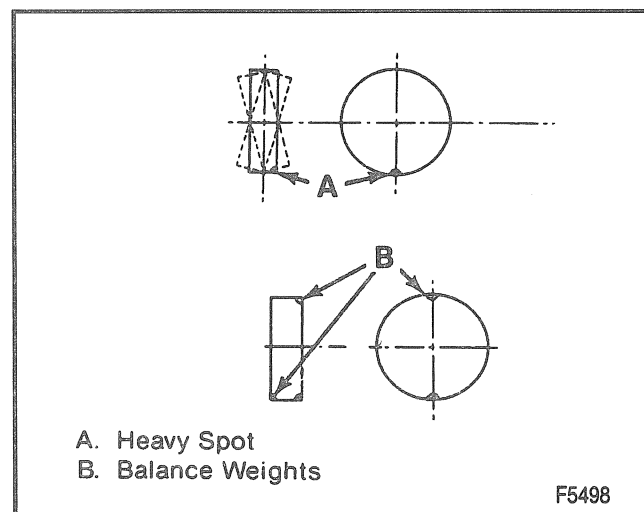


Figure 9—Static Unbalance

On-Vehicle Balancing

On-vehicle balancing will help correct vibrations due to brake drum, rotor, and wheel cover imbalance.

When balancing on-vehicle, remove the balance weights from the off-vehicle dynamic balance. If more than 28 grams (one ounce) of additional weight is required, it should be split between the inner and outer rim flange.

Important

- The driven tire and wheel assemblies should be spun using the engine. Limit speed as stated in the following Caution.

CAUTION: Do not spin the drive wheels faster than 55 km/h (35 mph) as indicated by the speedometer. This limit is necessary because the speedometer indicates only one-half of the actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Personal injury and damage may result from high speed spinning.

CAUTION: On vehicles equipped with limited slip rear axles, do not attempt to balance a tire on a drive wheel with the other drive wheel on the ground. The vehicle may drive through this wheel and cause the vehicle to move unexpectedly, resulting in personal injury and property damage.

To distinguish between a standard rear axle and a limited slip rear axle, check for Positraction (G80) on the Service Parts Identification label.

Wheel Weights

If more than 85 grams (3 ounces) are needed, the wheel weights should be split as equally as possible between the inboard and outboard flanges.

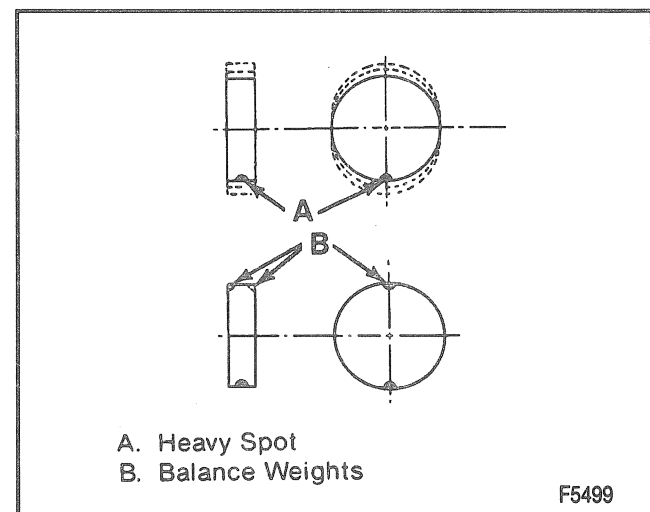


Figure 10—Dynamic Unbalance

Balancing of assemblies with factory aluminum wheels requires the use of special clip-on type wheel weights. These weights are designed to fit over the thicker rim flange of the aluminum wheel.

Adhesive wheel weights are also available. Use the manufacturer's procedures to install adhesive wheel weights.

WHEEL RUNOUT

Measure wheel runout with an accurate dial indicator. Take measurements with the wheel installed on the vehicle or off the vehicle using an accurate mounting surface such as on a wheel balancer. Measurements may be taken with or without the tire mounted on the wheel.

Radial runout and lateral runout should be measured on both the inboard and outboard rim flanges (Figure 11). With the dial indicator firmly in position, slowly rotate the wheel one revolution and record the total indicator reading. If any measurement exceeds specifications, and there is vibration that wheel balancing will not correct, the wheel should be replaced. Disregard any indicator readings due to welds, paint runs, scratches, etc.

• STEEL WHEELS:

Radial runout.....1mm (0.040 inch)
Lateral runout..... 1.2 mm (0.045 inch)

• ALUMINUM WHEELS:

Radial runout.....0.8 mm (0.030 inch)
Lateral runout.....0.8 mm (0.030 inch)

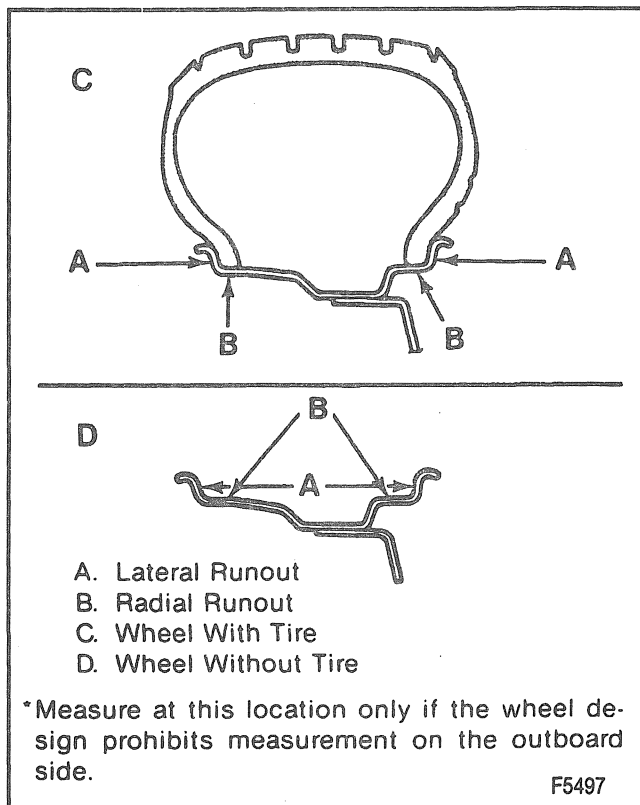


Figure 11—Wheel Runout

TIRE/WHEEL ASSEMBLY RUNOUT

Before measuring the runout of a tire/wheel assembly, the vehicle should be driven long enough to warm up the tires. Do this before any measurements are taken, then do the following:

1. Lift the vehicle and support with suitable safety stands.
2. Mark the location of each tire/wheel assembly in relation to the wheel studs and to their position on the vehicle.
3. Install tire/wheel assembly on wheel balancer.
4. Using a dial indicator with a magnetic base and a roller tip, position it on the balancer so the different runout checks can be done (Figure 12).
5. DO NOT start the wheel balancer with the dial indicator in place. These checks should be done by spinning the tire BY HAND ONLY on the tire balancer.
6. Slowly rotate the assembly one complete turn and "zero" the dial indicator on the low spot.
7. Rotate the assembly one more complete turn and note the amount of runout.

The maximum allowable radial and lateral runout is 1.3 mm (0.050 inch) when measuring off the vehicle, and 1.5 mm (0.060 inch) when measuring on the vehicle.

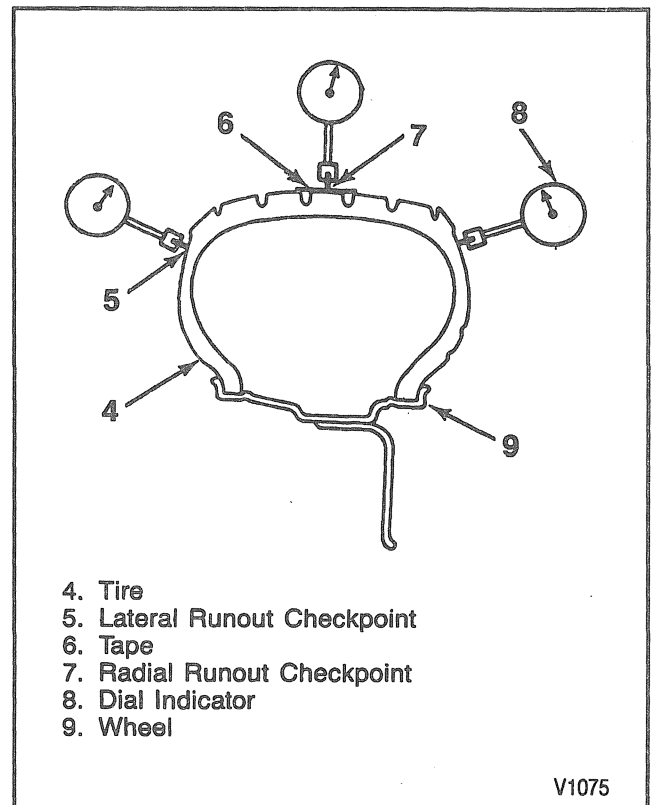


Figure 12—Measuring Radial and Lateral Runout

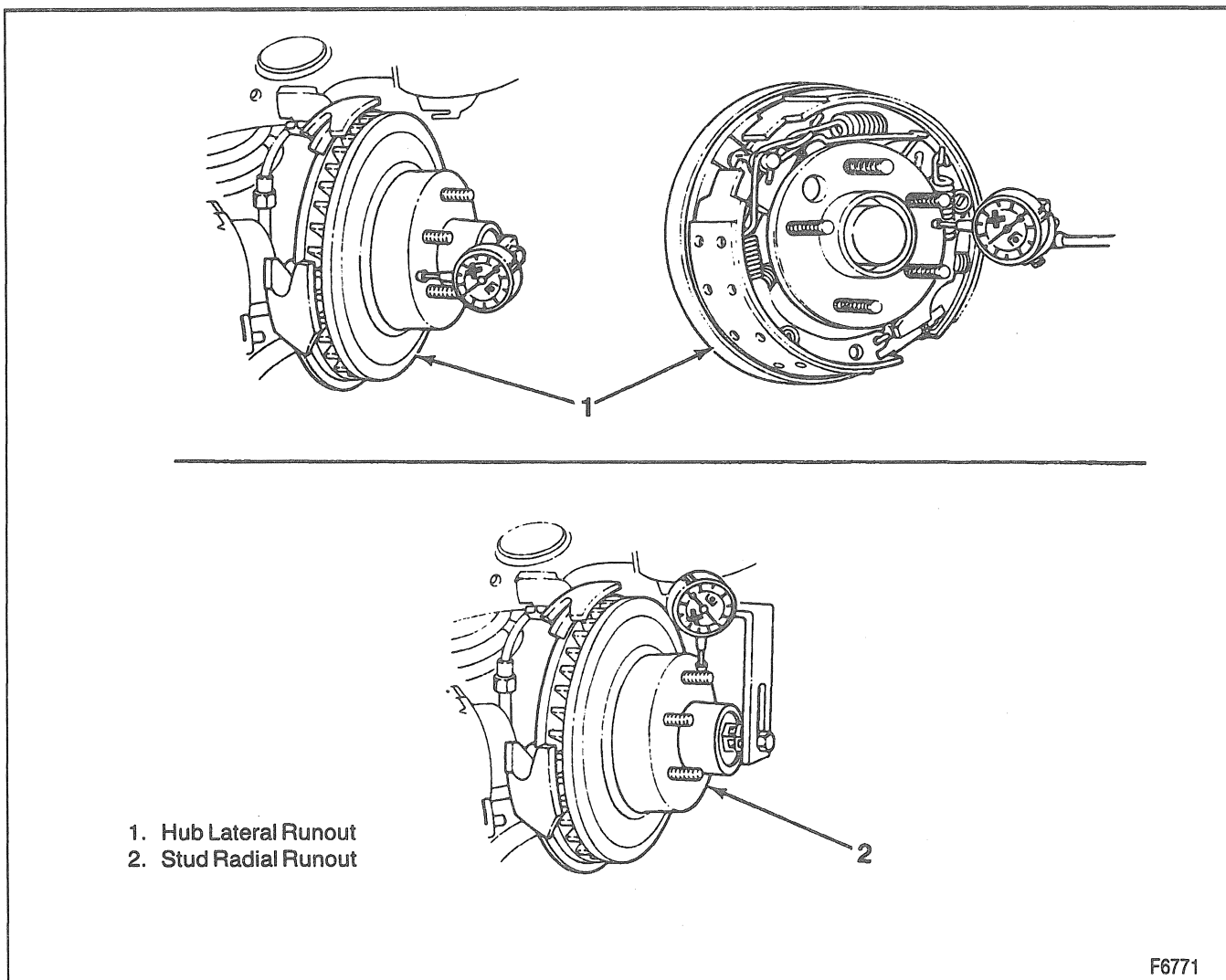


Figure 13—Hub and Axle Shaft Stud Runout

CORRECTING NON-UNIFORM TIRES

There are two ways to correct tires that cause a vibration even though they are properly balanced. One method uses an automatic machine which loads the tire and buffs small amounts of rubber from high spots on the outer two tread rows. Correction by this method is usually permanent and does not significantly affect the tire tread life.

Another method is to dismount the tire and rotate it 180 degrees on the rim. It is important that this be done on tire and wheel assemblies which are known to be causing a vibration as it is just as likely to cause good assemblies to vibrate.

HUB AND AXLE SHAFT STUD RUNOUT

When wheel and tire runout occurs on the vehicle and does not occur in off-vehicle testing, the hub and axle shaft should be checked (Figure 13).

Measuring Rotor or Axle Shaft Runout



Install or Connect

The dial indicator on the machined surface outside the bolts on the rotor or axle flange (Figure 13).



Measure

• Runout.

1. Turn the rotor or axle flange to locate the low spot.
2. Zero the dial indicator.
3. Turn the rotor or axle flange to check the total lateral runout.
 - 0.130 mm (0.005 inch) is the acceptable lateral runout.

Measuring Axle Shaft Stud Runout



Install or Connect

The dial indicator to contact the wheel mounting studs (Figure 13).


Measure

- Runout.
 1. Turn the hub to register on each of the studs.
 2. Zero the dial indicator on the lowest stud.

3. Check the total runout on the remaining studs.
 - 0.8 mm (0.030 inch) is the acceptable radial runout.

ON-VEHICLE SERVICE—DRIVELINE VIBRATIONS

Driveline vibrations will generally produce a high speed vibration, a “buzz” or “shudder.” With tire and wheel speeds in the 45 to 50 mph range, the average tire and wheel speeds are 600 rpm. A driveline will turn at a higher rpm because of the gear ratios. Most driveline vibrations occur in the 45 to 55 mph range, and most usually become strongest on either acceleration or deceleration. Driveline vibrations come from six general areas:

1. Shaft Balance
2. Shaft Runout
3. Pinion Flange Runout
4. Companion Flange Runout
5. Joint Phasing
6. Driveline Angles

Most driveline vibrations that are associated with a “buzz” or “shudder” type vibration will also have a high frequency reading on the reed tachometer or the EVA. Refer to “Reed Tachometer” or to “Electronic Vibration Analyzer” in this section.

PROPELLER SHAFT RUNOUT CHECK

Noise vibration at high speed could be caused by a bent propeller shaft. The propeller shaft could have been damaged by rough handling or a collision. Check for propeller shaft straightness.

1. Raise the vehicle on a twin post hoist so the wheels can spin.
2. Attach a dial indicator having a magnetic base to a smooth place on the vehicle underbody.
3. Take dial indicator readings at the propeller shaft check points (Figure 14).


Important

- Do not locate the dial indicator at a weld.
4. With the transmission in neutral, hand rotate the axle pinion flange or the transmission yoke and take the necessary dial indicator readings on the propeller shaft. Record the readings. If the runout is over specification at one or more check points, rotate the propeller shaft 180 degrees at the pinion flange or companion flange. Reinstall and check the runout. If the runout is still over specification check the pinion or companion flange runout. Use a dial indicator and J 35819 Companion Flange Runout Gage before replacing the propeller shaft (Refer to Figure 15). For models having a two-piece driveline, measure the rear propeller shaft runout first (Figure 14). Reference mark the position of the rear propeller shaft yoke to the pinion flange or companion flange, then remove the rear propeller shaft. Measure the front propeller

shaft runout on the tube and at the splined shaft end. If the runout exceeds the specifications found in Figure 14, replace the shaft.

- The runout of splined shaft end will affect the runout of the front measurement on the rear shaft.
5. Check the runout on the replacement propeller shaft. If the new propeller shaft runout is over specification, double-check the pinion flange runout (Figure 15).


Important

- The splined end of the front propeller shaft is critical to the smooth operation of a two-piece driveline. Be sure the dial indicator readings are accurate.

PROPELLER SHAFT BALANCE CHECK


Remove or Disconnect

- Raise the vehicle on a twin post hoist so the wheels can spin.
1. Tire and wheel assemblies and the brake drums.

CAUTION: Do not apply the brake with the drums removed or personal injury and vehicle damage may occur.


Inspect

- Propeller shaft, universal joints, and attachments for mud, undercoating, or loose fasteners.


Clean

- Propeller shaft, universal joints, and attachments.

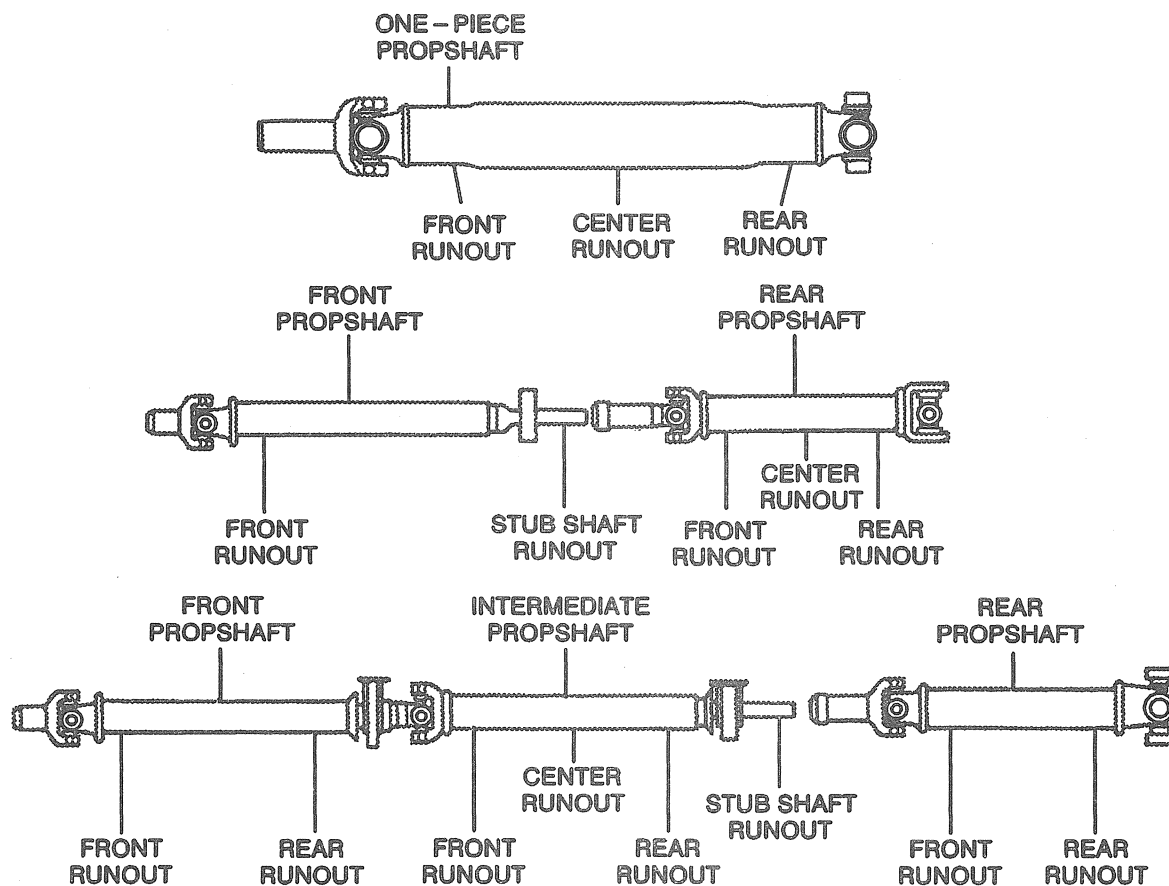

Tighten

- Any loose attachments or fasteners.


Important

- Run the vehicle in gear at the speed where the vibration peaks; observe the intensity of the vibration as indicated by the reed tachometer. The greater the disturbance, the greater the amount of amplitude that will be seen on the reed tachometer or the EVA. When using the reed tachometer or EVA to check propeller shaft balance, hold the reed tachometer or fasten the EVA sensor on a stationary component as close

0C-12 VIBRATION DIAGNOSIS



| PROPELLER SHAFT | FRONT CHECK | CENTER CHECK | REAR CHECK |
|--|-------------|--------------|------------|
| One Piece | 0.025" | 0.050" | 0.025" |
| Two Piece Driveshaft: | | | |
| Front Piece | 0.025" | 0.005"* | |
| Rear Piece | | 0.030"† | 0.030" |
| *NOTE: This measurement must be taken on the ground surface near the spline, with the rear propeller shaft removed. | | | |
| †NOTE: This measurement must be taken with the rear propeller shaft mounted on the front shaft which is within specifications. | | | |

Figure 14—Checking Propeller Shaft Runout

PROPELLER SHAFT BALANCING

Hose Clamp Method (Figures 16 through 18)

1. Place the vehicle on a twin-post hoist so that the rear of the vehicle is supported on the rear axle housing and the rear wheels are free to rotate. Remove both rear wheel assemblies and reinstall the wheel lug nuts with flat sides next to the drums.
2. Mark and number propeller shaft at four points 90 degrees apart at the rear of the propeller shaft just forward of the balance weights (Figure 16).
3. Install two hose clamps on the rear of the propeller shaft and slide them rearward until the clamps stop at the nearest balance weight welded to the tube. Align both clamps at any one of the four marks made on the shaft in Step 2 and tighten.
4. Run the vehicle through the speed range to 81 to 89 km/h (50 to 55 mph). Note the amount of imbalance felt at the front of axle housing or as indicated by a reed tachometer or the EVA sensor. Refer to Figures 16 and 17.

CAUTION: Never run vehicle higher than 89 km/h (55 mph). All persons should stay clear of universal joints and balance weight areas to avoid possible injury. Do not run the vehicle on the hoist for extended periods due to the danger of overheating the transmission or engine.

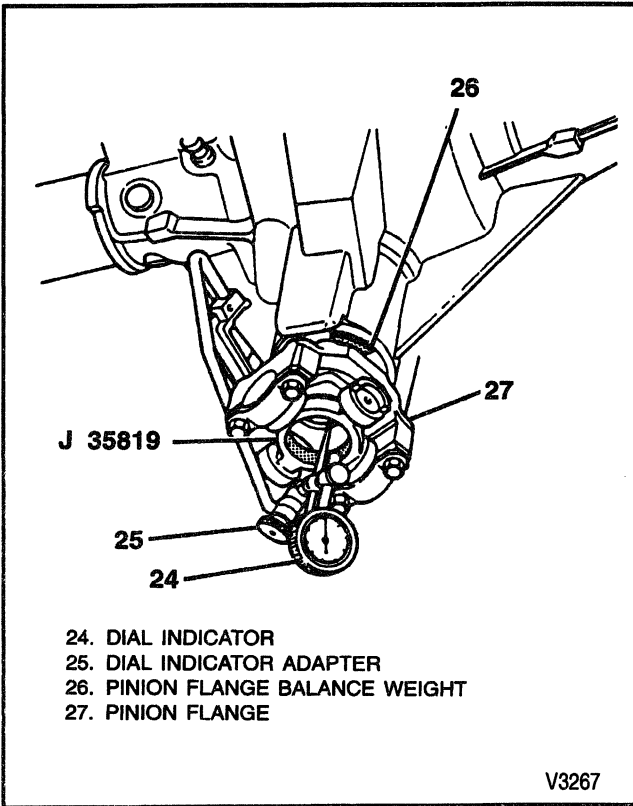


Figure 15—Pinion Flange Runout

to the vibration as possible when reading the amplitude. Refer to "Reed Tachometer" or "Electronic Vibration Analyzer" in this section.

- Stop the engine.
2. Propeller shaft.

NOTICE: A screwdriver or bar should not be used in the universal joint/spider location, to rotate the propshaft because seal damage may result. Use a chain or strap wrench wrapped around the pinion flange to rotate propshaft.

- Rotate the propeller shaft 180 degrees from the original position.



Install or Connect

1. Propeller shaft.
 - Determine the position which gives the lowest amplitude reading on the reed tachometer or EVA.
2. Rear drums, wheels, and tire assemblies.
 - Determine the position which gives the best driveline response by road testing the vehicle for a final check of the propeller shaft balance.
 - For unacceptable balance, refer to "Propeller Shaft Balancing."

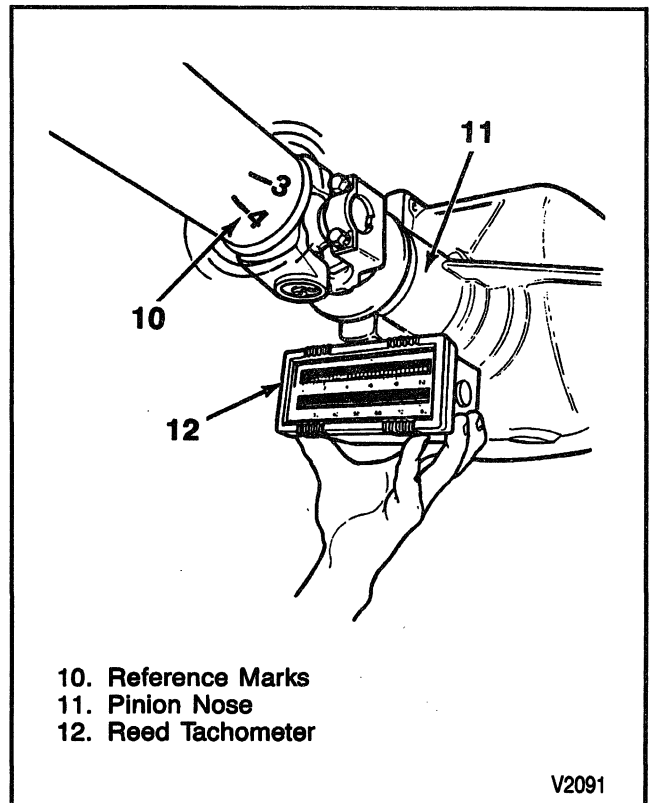


Figure 16—Propeller Shaft Reference Marks and Reed Tachometer Position

OC-14 VIBRATION DIAGNOSIS

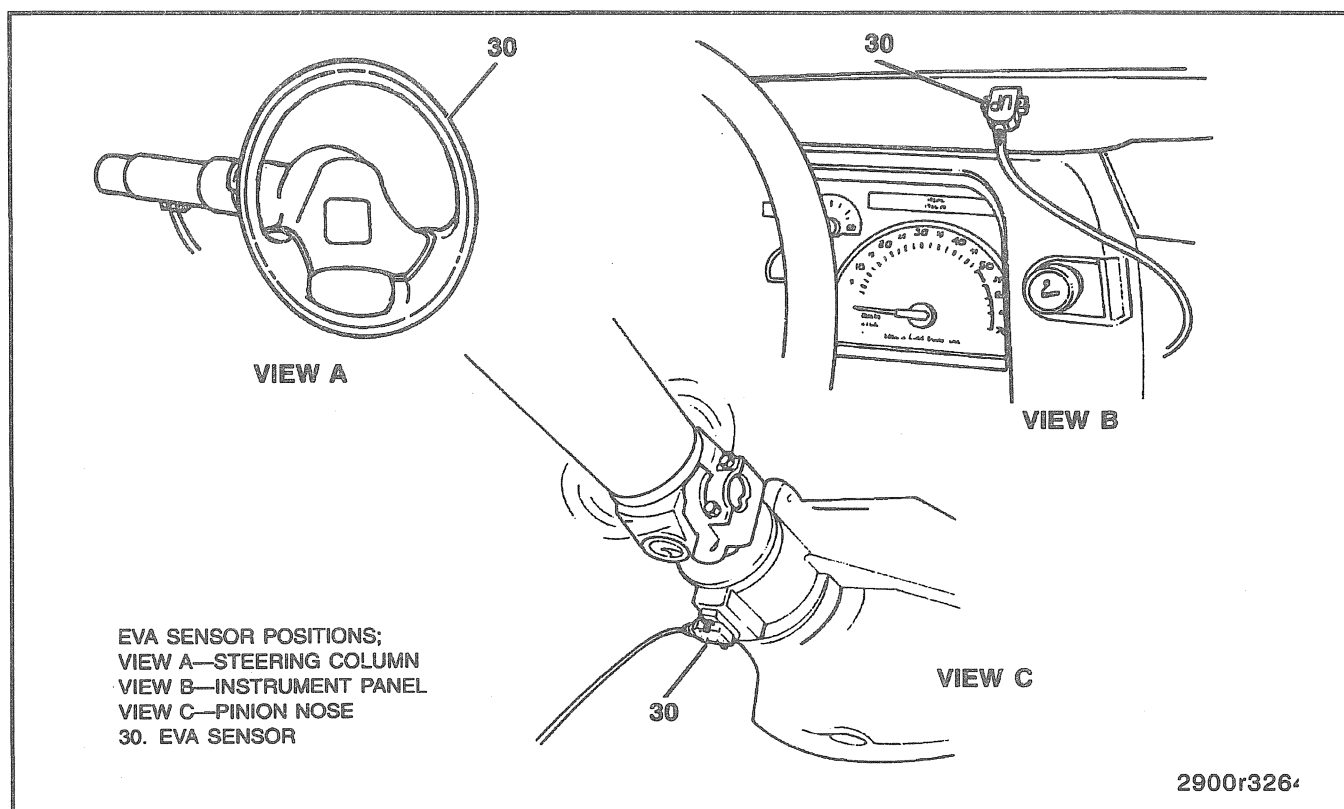


Figure 17—EVA Sensor Positions

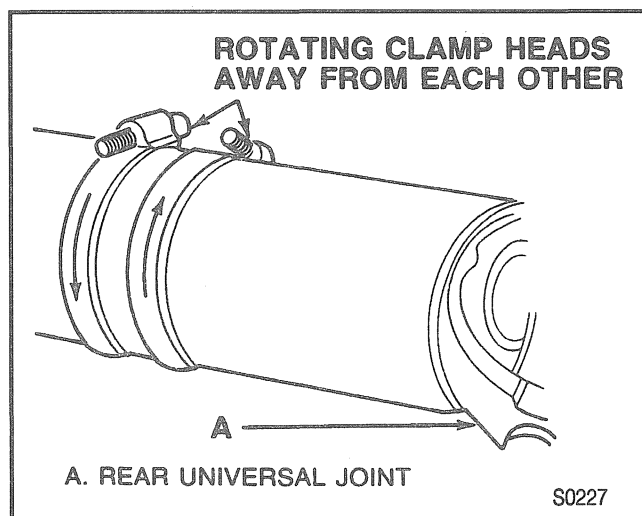


Figure 18—Rotating Hose Clamps

5. Loosen clamps and rotate clamp heads 90 degrees to the next mark on the propeller shaft. Tighten clamps and repeat Step 4.
6. Repeat Step 5 until vehicle has been run with clamp heads located at all four marks on shaft.
7. Position clamps at point of least imbalance. Rotate the clamp heads away from each other 45 degrees (one on each side of the position) (Figure 18). Run the vehicle and note if balance has improved. In some cases it may be necessary to use one clamp

or possibly three clamps in order to obtain a good balance. Replace the propeller shaft if three hose clamps do not improve the balance.

8. Continue to rotate the clamps apart in smaller angular increments until the balance of the propeller shaft is achieved.
9. Reinstall wheel assemblies and road test the vehicle for final check of balance. A minimal vibration felt in the vehicle on the hoist may not show up during a road test.

Strobe Light Method (Figures 8, 19, and 20)

Either a strobe light wheel balancer or an EVA can be used to balance a propeller shaft. The balance pickup unit should be placed directly under the nose of the axle carrier and as far forward as possible. When using the EVA for propshaft balancing, connect the strobe light to the trigger wire on the front of the EVA. By pushing the strobe button on the EVA's keypad, the EVA will go into the strobe mode, allowing the strobe light to flash.

1. Place the vehicle on a twin post hoist so the rear of the vehicle is supported on the rear axle housing and the rear wheels are free to rotate. Lower the hoist and allow the axle to rest on jackstands. Leaving the axle in the hoist fixture can destroy the sensitivity of the operation. Remove both rear wheel assemblies and reinstall wheel lug nuts with flat sides next to the drums.
2. Mark and number the propeller shaft at four points 90 degrees apart at the rear of the propeller shaft just forward of the balance weights.

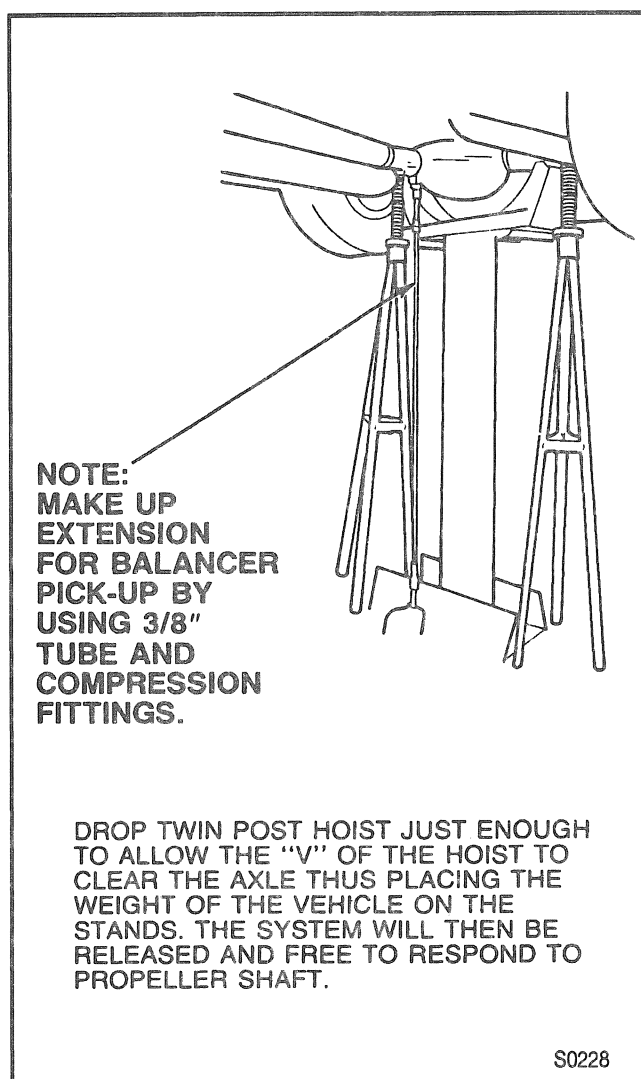


Figure 19—Pickup Unit Replacement

3. Place the strobe light wheel balancer pickup or the EVA sensor under the nose of the carrier (Figures 17 and 19).
4. Run the vehicle in gear at the speed where the disturbance is at its peak, as indicated by driver input and by use of a reed tachometer or EVA holding at a constant speed. Point the strobe light up at the spinning propeller shaft and note the position of one of the reference numbers. Shut the engine off and position the propeller shaft so the reference numbers will be in the same position as was noted while the shaft was rotating. When the strobe light flashed, the heaviest point of the propeller shaft was at the bottom (6 o'clock). To balance the propeller shaft, it is necessary to apply the balancing weights (hose clamps) 180 degrees away from the heaviest point or at the top of the propeller shaft (12 o'clock).
5. Install two screw-type hose clamps on the propeller shaft as close to the balance weight and rear of the propeller shaft as possible. Position both clamp heads 180 degrees from the heaviest point on the propeller shaft as indicated by the strobe light. Tighten clamps.
6. Run the vehicle through the speed range. If disturbance is gone, nothing further need be done on the hoist. If the disturbance is not gone, and the strobe light shows the clamp heads at the bottom (6 o'clock) of the propeller shaft, go to Step 7. If the strobe light shows the two clamp heads at the top of the propeller shaft, add one more hose clamp and recheck. If the strobe light shows the three clamp heads at the top of the propeller shaft, remove the propeller shaft and re-index it 180 degrees on the rear axle pinion flange. Recheck without clamps. Repeat balance starting with Step 5. If the propeller shaft still needs more than three hose clamps at the same clock position, replace it.



Important

- Before replacing the propeller shaft double-check the pinion flange runout (Figure 15).

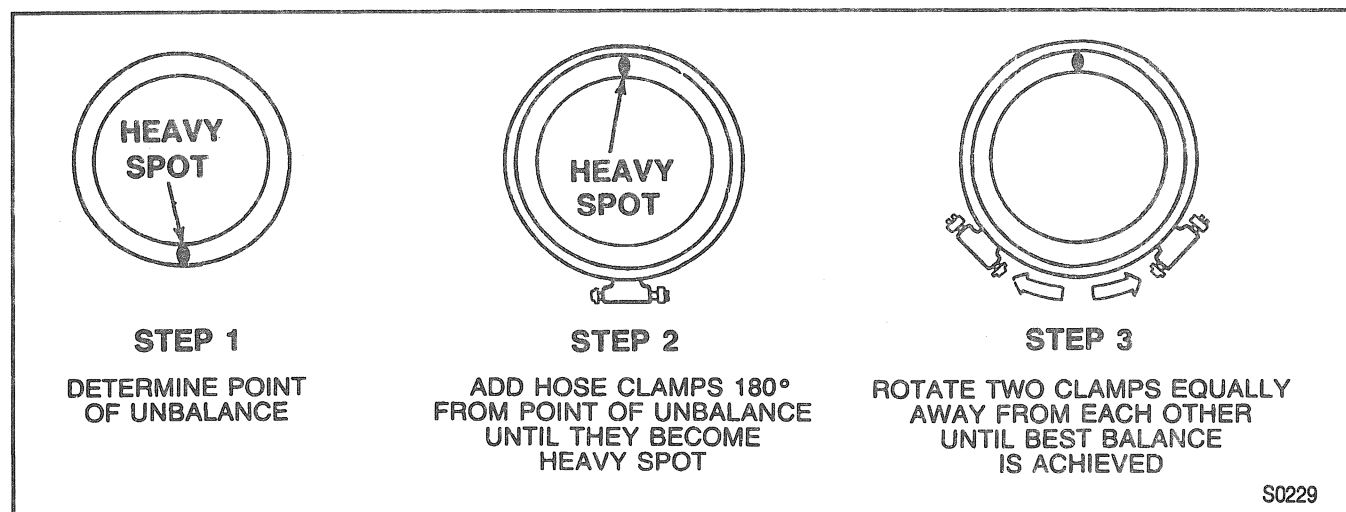


Figure 20—Positioning Hose Clamps to Achieve Best Balance

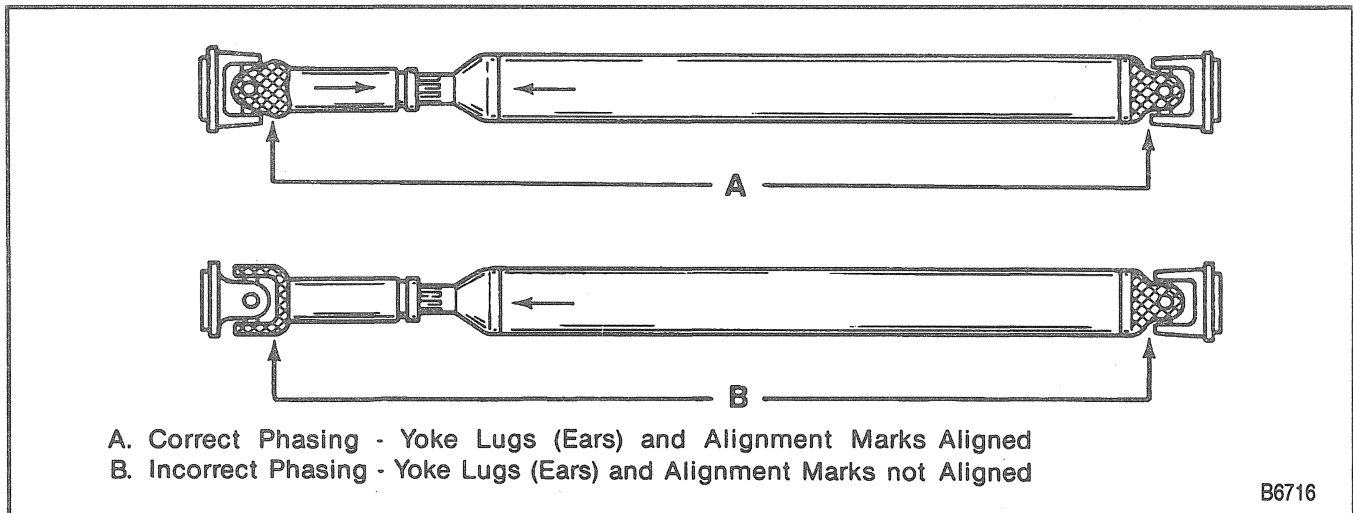


Figure 21—Phasing

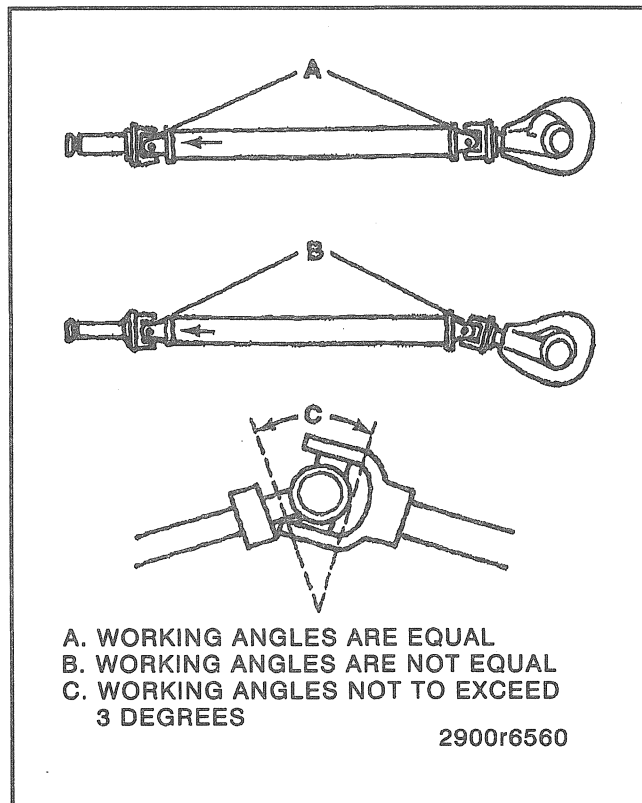


Figure 22—Working Angles

If the clamps are 180 degrees from their original position after the propeller shaft was reindexed, the axle pinion flange is out of balance and must be replaced. DO NOT use more than three hose clamps to balance the propeller shaft. If the strobe light shows the hose clamps at the bottom of the propeller shaft, but the disturbance still exists, go to Step 7.

7. Rotate two of the hose clamps equal distances away from each other toward the top (one on each side of the position) in small increments until the best balance is achieved (Figure 20). In some cas-

es, it may be necessary to use one clamp or possibly three clamps in order to obtain a good balance. Replace the propeller shaft if three hose clamps do not correct the problem.

8. Install the wheels and road test the vehicle for a final check of balance. Vibration felt in the vehicle on the hoist may not show up during a road test.

PROPELLER SHAFT PHASING

The propeller shaft is designed and built with the yoke lugs (ears) in line with each other. This design produces the smoothest running shaft possible, and is called phasing (Figure 21).

Vibration can be caused by an out-of-phase propeller shaft. The propeller shaft will absorb vibrations from speeding up and slowing down each time the universal joint goes around. A total cancellation of vibration produces a smooth flow of power in the driveline.

DRIVELINE ANGLES

When two shafts intersect at any common universal joint, the bend that is formed is called the working angle (Figure 22). The working angle should not exceed 3 degrees. The larger the working angle, the greater the amount of acceleration and deceleration of the universal joint. For every revolution of the propeller shaft, there are two accelerations and decelerations of the universal joints. This speeding up and slowing down of the universal joint must be canceled out to produce a smooth power flow. This is done through phasing and proper universal joint working angles.

Measuring Driveline Angles

Driveline angles can be measured using an inclinometer. Support the vehicle at curb weight with a full tank of gasoline. Install the J 23498-A inclinometer on the propeller shaft bearing cap (Figure 23).

Angle at Rear Universal Joint

1. Place inclinometer J 23498-A on rear propeller shaft bearing cap (Figure 24). Center the bubble in the sight glass and record the measurement. The bearing cap must be straight up and down and free

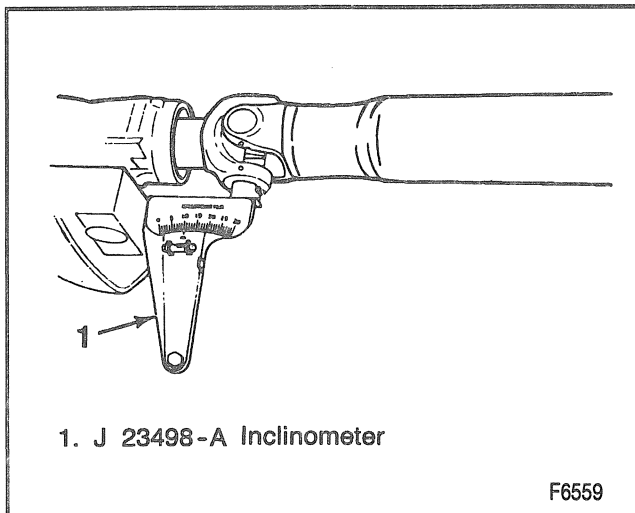


Figure 23—Measuring Driveline Angles

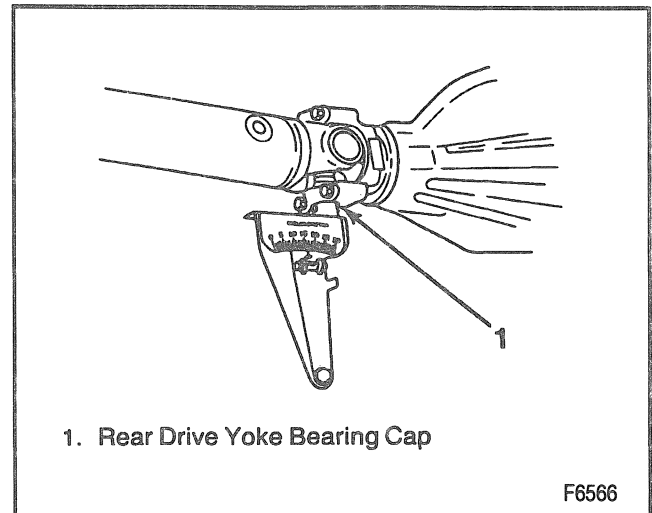


Figure 25—Measuring Rear U-Joint Working Angle

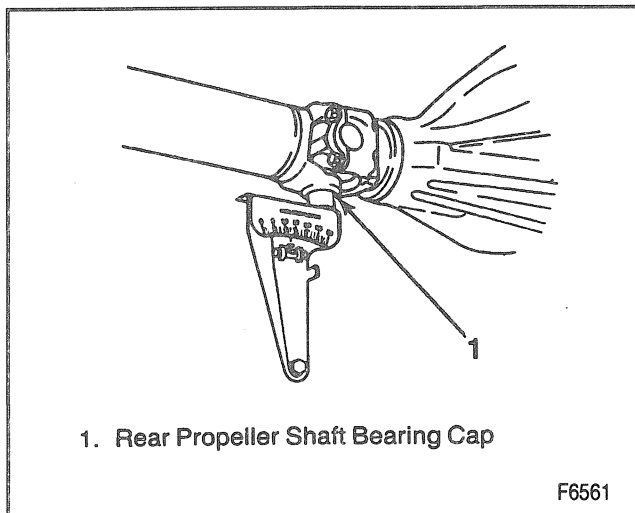


Figure 24—Measuring Rear U-Joint Working Angle

of dirt or other foreign material to obtain an accurate measurement.

2. Rotate the propeller shaft 90 degrees and place the inclinometer on the rear drive yoke bearing cap (Figure 25). Center the bubble in the sight glass and record the measurement.
3. Subtract the small figure from the larger figure to obtain the rear universal joint angle.

Angle at Front Universal Joint

1. Place the inclinometer on front propeller shaft bearing cap (Figure 26). Center the bubble in the sight and record measurement.
2. Rotate the propeller shaft 90 degrees and place the inclinometer on the front slip spline yoke bearing cap (Figure 27). Center the bubble on the sight glass and record the measurement.
3. Subtract the smaller figure from the larger figure to obtain the front universal joint angle.

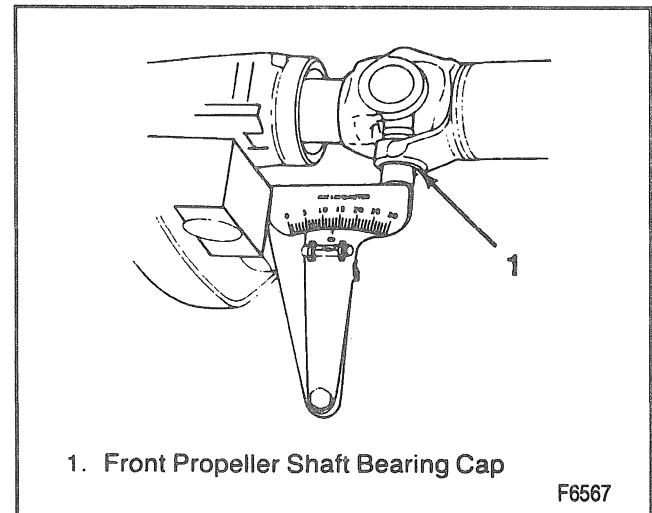


Figure 26—Measuring Front U-Joint Working Angle

Rules For Measuring Driveline Angles

Rule Number 1 —The working angles of each pair of U-joints must be within one-half degree of being equal on shafts that turn at 3200 rpm or higher, or within one degree of being equal on shafts that turn at speeds below 3200 rpm.

Rule Number 2 —(Involves a two drive shaft, three U-joint system). With a three-joint system there is always an odd joint that cannot be paired with another joint. Since the U-joint between the transmission and the front shaft does not have a mate to cancel out its acceleration and deceleration, this front shaft should be within one-half degree of the transmission angle for high-speed shaft and within one degree for low-speed shafts. If the rear-end pinion angle is not equal to either the engine/transmission angle or front shaft angle, it should be at an angle between those two. There can be a one-half degree difference between the center and rear U-joint working angles, provided neither of the working angles exceed 3 degrees on high-speed shafts (turning at 3200 rpm or higher), or 5 degrees on low-speed shafts (turning below 3200 rpm).

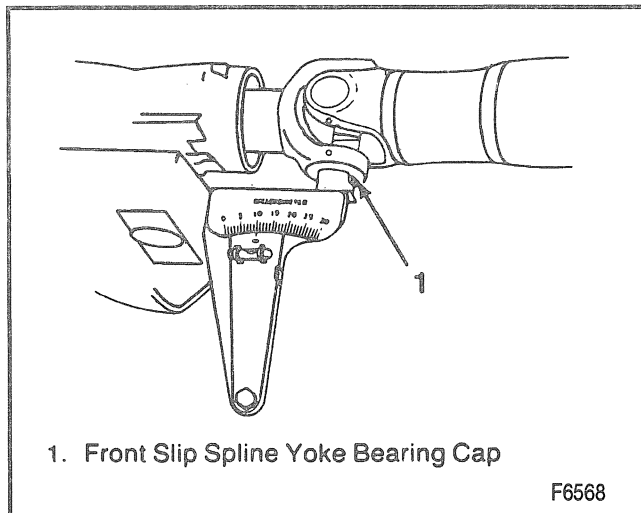


Figure 27—Measuring Front U-Joint Working Angle

VIBRATION DIAGNOSIS CHARTS

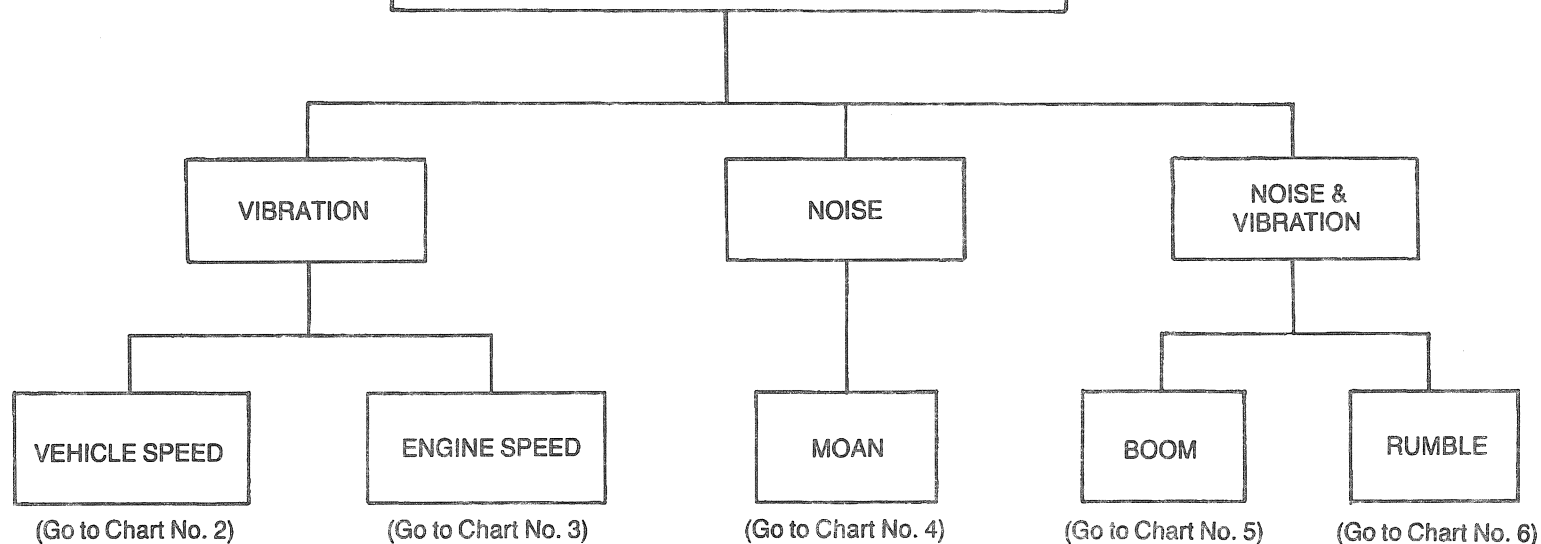
Refer to Figures 28 through 35.

TECHNICIAN VIBRATION DIAGNOSIS FORM

The form used for diagnosing a vibration problem is found after the vibration diagnosis charts. Copies of this form should be made for future use.

NOISE AND VIBRATION INDEX CHART

Ride vehicle (with customer if possible) to point out complaint. Check tire condition and pressures. Use "Reed" Tachometer to identify vibration frequency. Refer to "Reed Tachometer" in this section.



VEHICLE SPEED — Speedometer (vehicle speed) related.

ENGINE SPEED — Tachometer (engine speed) related.

MOAN — A low frequency noise which sounds like exhaust noise, is engine rpm and/or engine torque sensitive. Most customers will complain of noise — maybe a vibration or buzz in floor.

BOOM — A drum sound which occurs on impact with hole or seams in the road then dies out, could have a vibration along with the drumming sound.

RUMBLE* A steady drumming sound and vibration which is vehicle speed sensitive and continues as long as the vehicle speed is maintained, regardless of engine speed.

***NOTE:** "Load sensitive rumble" — may only be noted with certain vehicle loads and speed conditions.

"Height (jounce) sensitive rumble" — Noise and vibration will vary in intensity and degree as vehicle height change takes place with road terrain change.

Figure 28—Vibration Diagnosis Chart #1

VIBRATION — Vehicle Speed Sensitive (Vibration Occurs at a Specific Vehicle Speed)

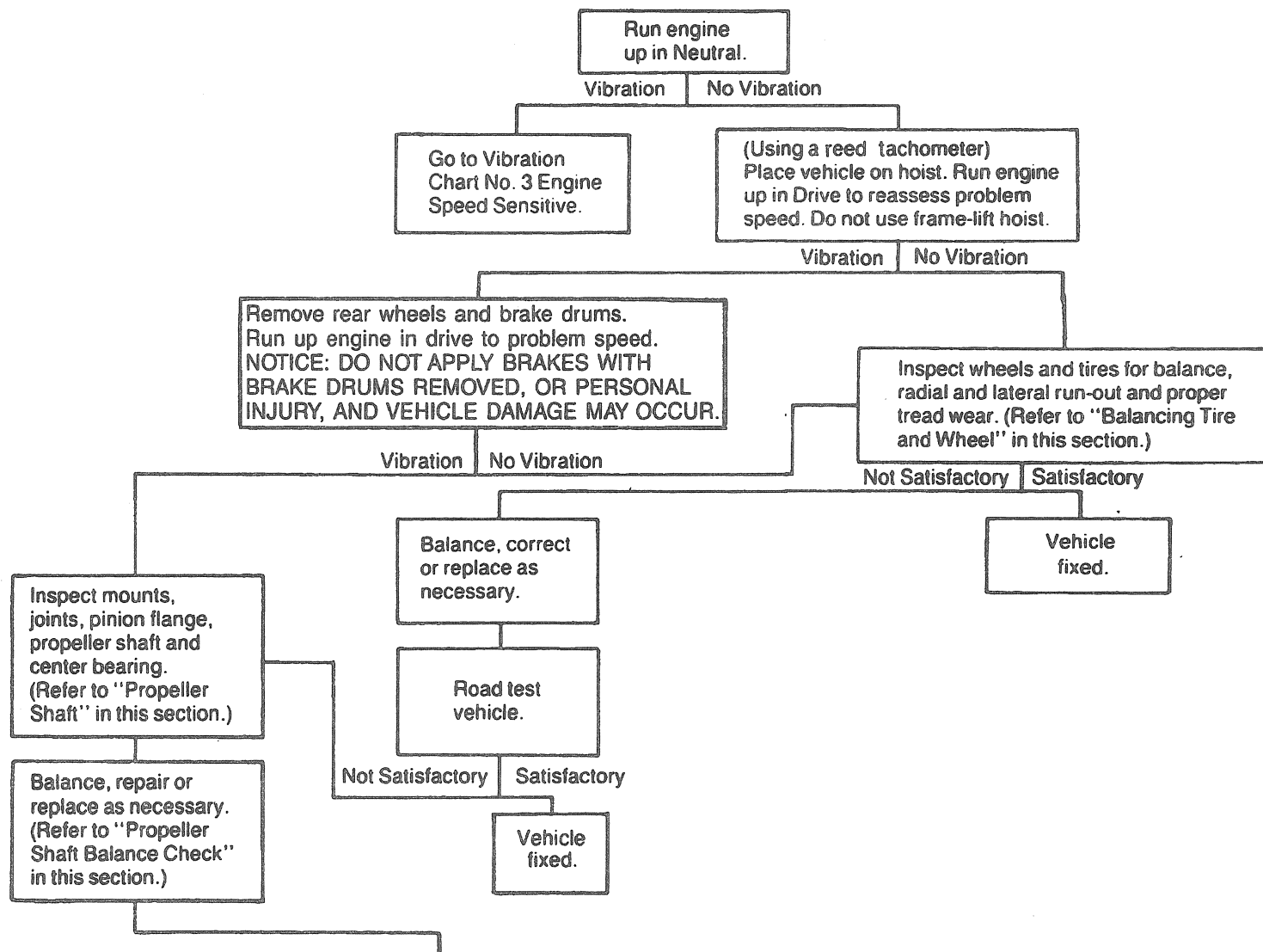


Figure 29—Vibration Diagnosis Chart #2

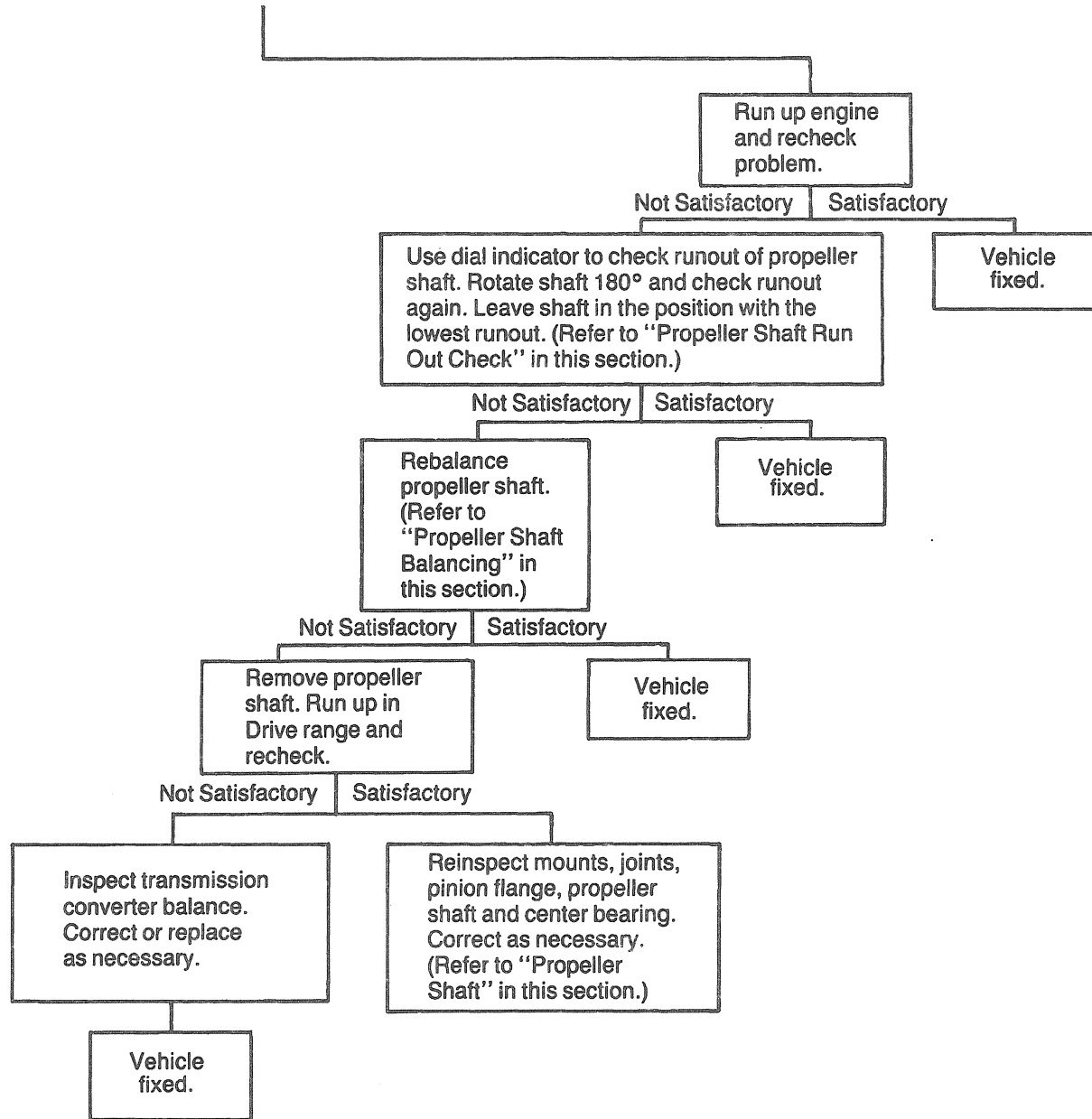


Figure 30—Vibration Diagnosis Chart #2 Continued

VIBRATION — Engine Speed Sensitive (A vibration occurring at a certain engine tachometer reading regardless of vehicle speed)

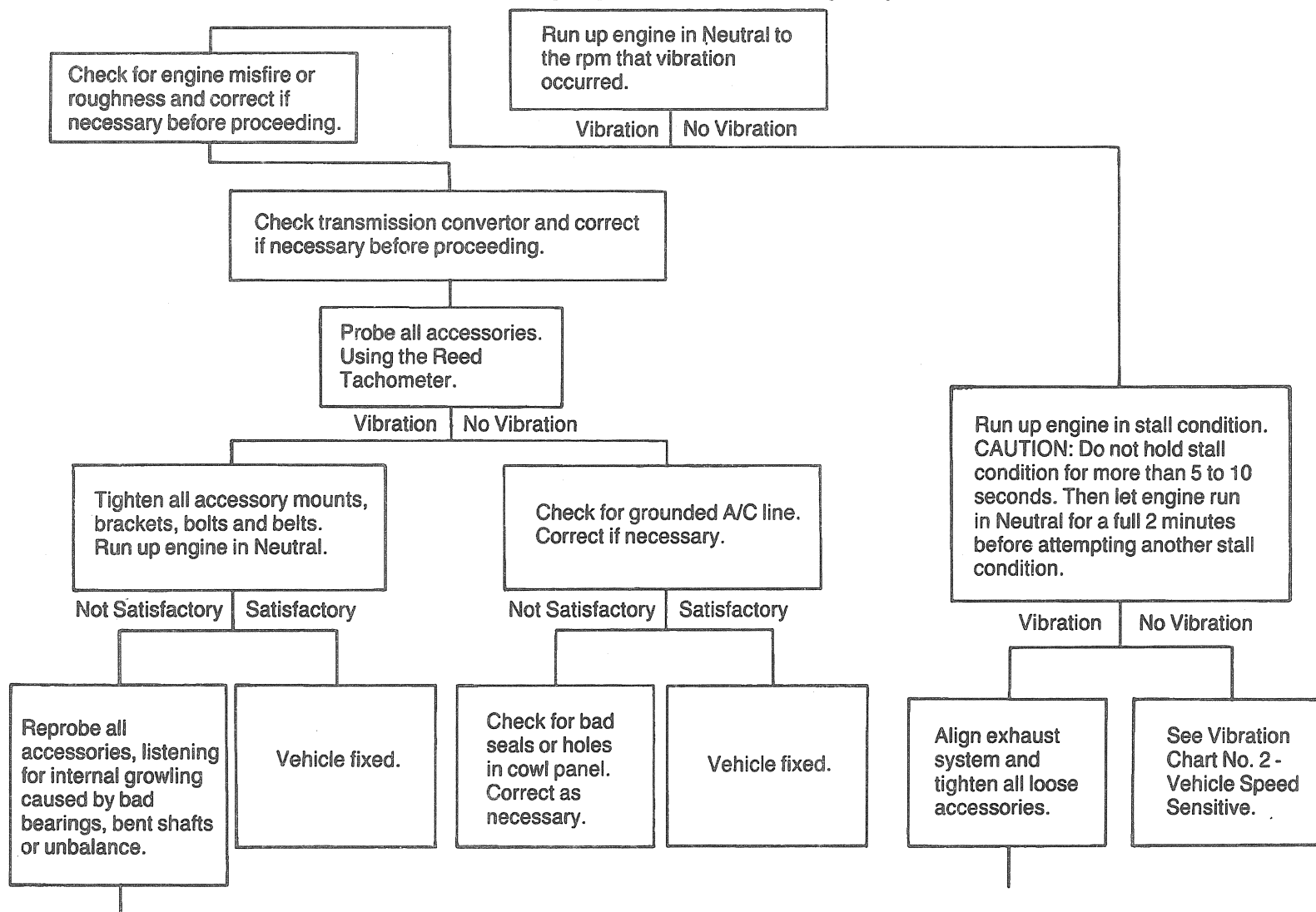
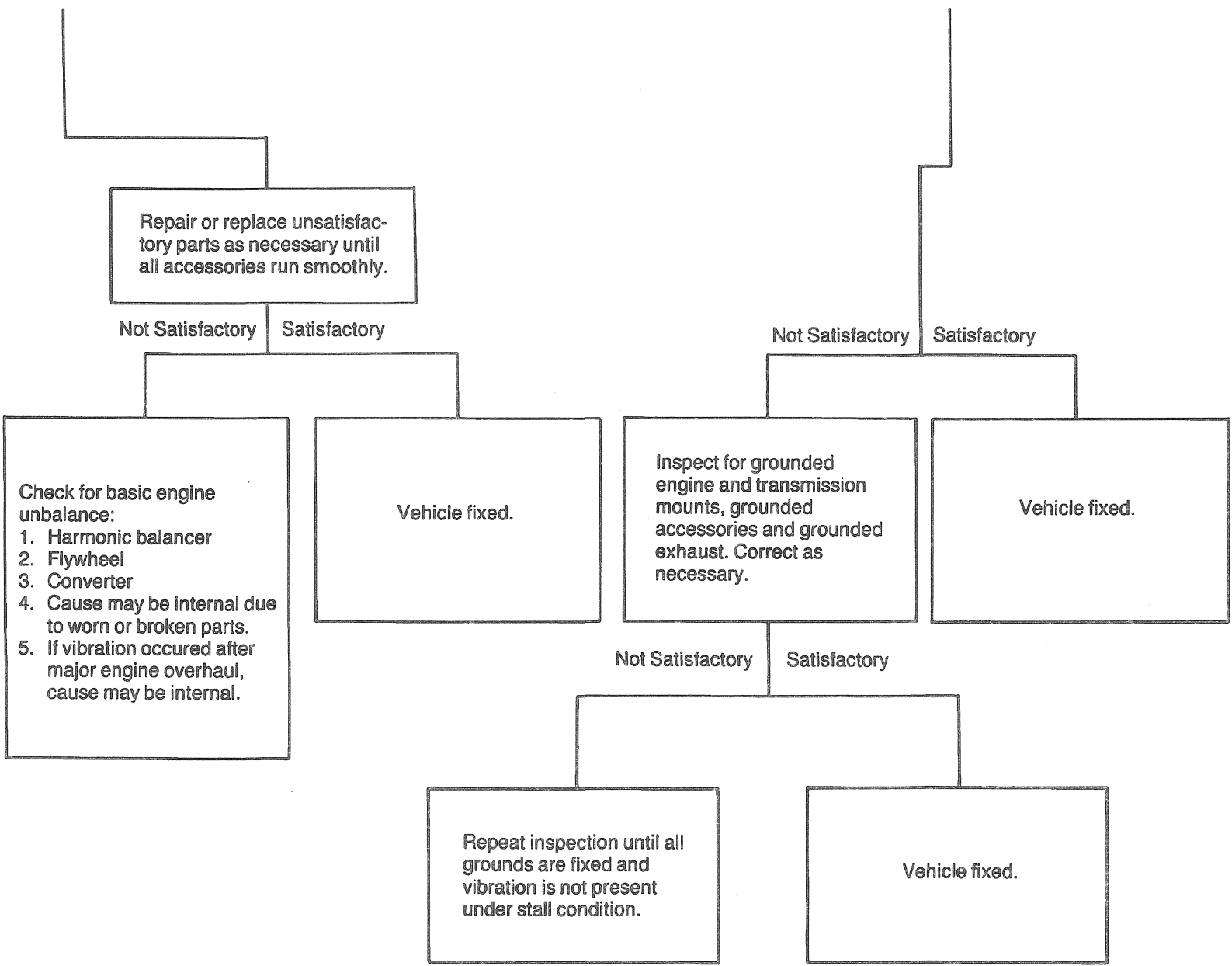


Figure 31—Vibration Diagnosis Chart #3

F6775

F6776

Figure 32—Vibration Diagnosis Chart #3 Continued



MOAN

(Low Frequency Noise Which Sounds Like Exhaust Noise, is Engine RPM and/or Engine Torque Sensitive — Sometimes Accompanied by Vibration or Buzz in Floor)

Visually and physically inspect and correct:

1. Loose air cleaner wing nut.
2. Loose accessory drive belts.
3. All accessory mounting brackets and bolts for tightness.
4. Grounded A/C lines.
5. Grounded engine and transmission mounts.
6. Grounded exhaust system.

Figure 33—Vibration Diagnosis Chart #4

BOOM — Noise and Vibration
 (A drum sound which occurs on impact
 with holes or seams in the road surface)

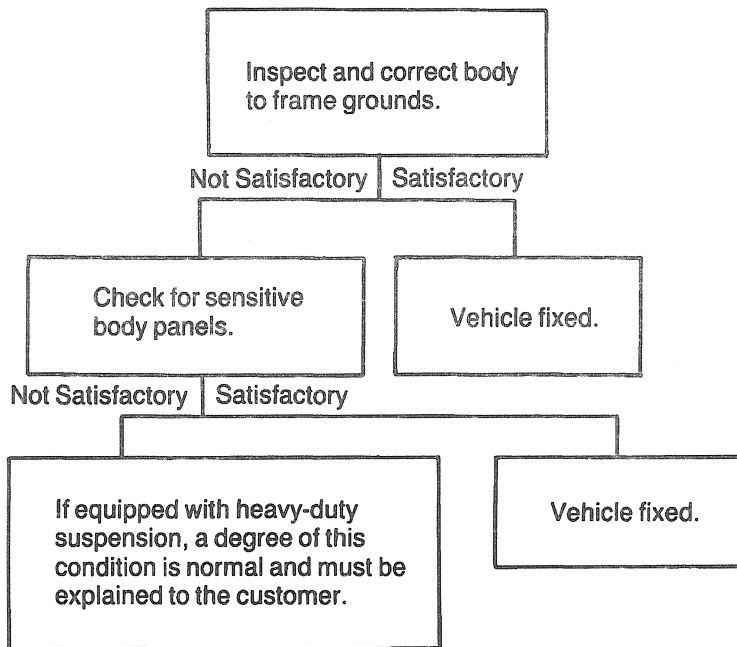
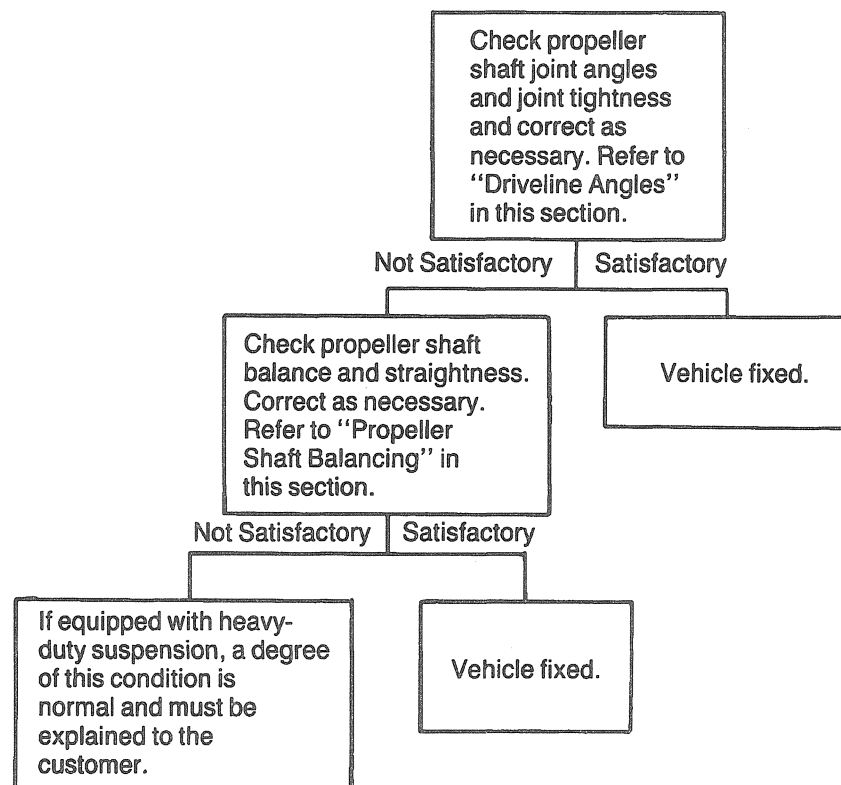


Figure 34—Vibration Diagnosis Chart #5

RUMBLE — Noise and Vibration (A steady drumming sound which is vehicle speed sensitive and continues as long as vehicle speed is maintained)



NOTE: Rumble may be vehicle load sensitive or vehicle height sensitive.
Refer to "Vibration Categories" in this section.

Figure 35—Vibration Diagnosis Chart #6

TIRE/WHEEL AND PROPSHAFT ROTATION

Vehicle Information

Complaint Speed: _____ mph

Year: _____ Model: _____

Symptom: _____

VIN: _____

Frequency: _____

Engine: _____ Trans: _____

Engine Speed: _____ rpm

Tire Size: _____ Axle Ratio: _____

Gear: _____

TPC Spec: _____

Tire/Wheel Speed

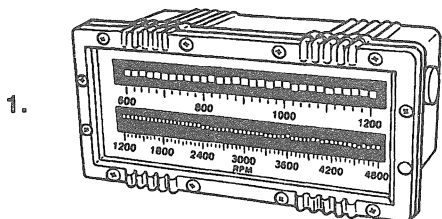
| | | | | | |
|----------------------|----------------------|----------------------------------|---|----------------------|--------------------------------------|
| Vibration Occurs at: | <input type="text"/> | mph ÷ 8 (km/h) | = | <input type="text"/> | increments of 8 km/h |
| 8 km/h increments | <input type="text"/> | x <input type="text"/> | | <input type="text"/> | |
| | | tire RPS* at 8 km/h (from chart) | = | <input type="text"/> | Tire/Wheel Speed, RPS (Hz) 1st order |
| 1st order | <input type="text"/> | x 2 | = | <input type="text"/> | 2nd order |
| 1st order | <input type="text"/> | x 3 | = | <input type="text"/> | 3rd order |

Propshaft Speed

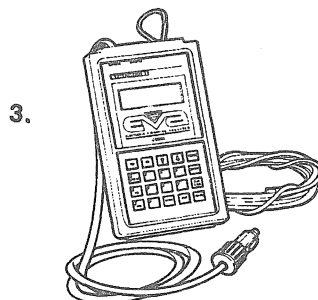
| | | | | | |
|---------------------|----------------------|------------------------|---|----------------------|---------------------------|
| 1st order tire | <input type="text"/> | x <input type="text"/> | | <input type="text"/> | |
| | | (axle ratio) | = | <input type="text"/> | Propshaft Speed 1st order |
| 1st order propshaft | <input type="text"/> | x 2 | = | <input type="text"/> | 2nd order |

*RPS=revolutions per second; equates to cycles per second (Hz).

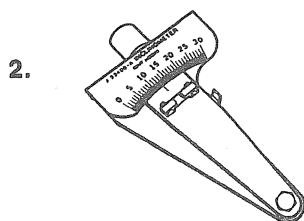
SPECIAL TOOLS



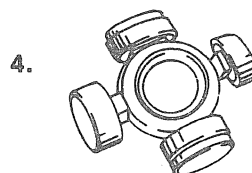
P/N 313510



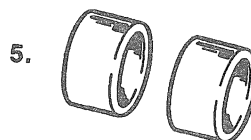
J 38792



J 23498-A



J 35819



J 35819-100

1. BIDDLE FHRAM REED TACHOMETER
2. INCLINOMETER
3. ELECTRONIC VIBRATION ANALYZER (EVA)
4. COMPANION FLANGE RUNOUT GAGE
5. RUNOUT GAGE ADAPTER SLEEVES